CLINICAL PROFILE OF HYPERTENSION AND DIABETES MELLITUS IN ELDERLY – A STUDY OF 75 IN-PATIENTS

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GOVT. STANLEY MEDICAL COLLEGE & HOSPITAL
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CHENNAI, INDIA

MARCH 2009

CERTIFICATE

This is to certify that the dissertation titled **"CLINICAL PROFILE OF HYPERTENSION AND DIABETES MELLITUS IN ELDERLY – A STUDY OF 75 IN-PATIENTS"** is the bonafide original work of **Dr. R.ANITHA,** in partial fulfillment of the requirements for M.D. Branch – I (General Medicine) Examination of the Tamilnadu DR. M.G.R Medical University to be held in MARCH 2009. The Period of study was from February 2007 to May 2008.

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DECLARATION

I, **Dr. R. ANITHA,** solemnly declare that dissertation titled **"CLINICAL PROFILE OF HYPERTENSION AND DIABETES MELLITUS IN ELDERLY – A STUDY OF 75 IN-PATIENTS"** is a bonafide work done by me at Government Stanley Medical College and Hospital during February 2007 to May 2008 under the guidance and supervision of my unit chief **Prof. S.Ramasamy, M.D.,** Professor of Therapeutics, Government Stanley Medical College and Hospital, Chennai.

This dissertation is submitted to Tamilnadu Dr. M.G.R Medical University, towards partial fulfillment of requirement for the award of **M.D. Degree (Branch – I) in General Medicine – March 2009.**

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CONTENTS

INTRODUCTION

Advances in medical science and improved social conditions during the past few decades have increased the life expectancy of humans. This phenomenon of population ageing has placed the developing nation, India, too amidst the demographic transition towards ageing trend. Further, graying of population is faster in India than many European and developed countries. This has changed the emphasis from communicable to non-communicable diseases.

The prevalence of diabetes and hypertension increases with age and they form the major risk factors for increased morbidity and mortality rates among the elderly. The clinical presentation of diabetes and hypertension in this subgroup is somewhat different from the younger group of patients and calls for studies on the unusual future.

Geriatric hospital admission rates not only depend on the increased prevalence of non communicable risk factors but also on their nutritional status and socio-demographic profile.

In-depth epidemiological studies on old people are the need of the day to understand and reflect on the necessities of the geriatric population. Hence this study is undertaken to have a detailed analyses of the hypertensive and diabetic elderly patients admitted to medical wards.

AIMS OF THE STUDY

- To study the clinico-laboratory and complication profile of elderly diabetics and hypertensives.
- To study the other associated cardiovascular risk factors and co morbid illness in them.
- To study the frequency and reason for admissions to medical wards in these people.

REVIEW OF LITERATURE

Changing Demographics – An Ageing nation

Decreasing mortality rates and increasing life expectancy at birth are the results of expanding health services which has curtailed the communicable diseases to a large extent. This has resulted in a demographic transition leading to higher proportion of elderly people. And elderly population is increasing twice as fast as general population.

The elderly population in developing countries is predicted to increase by 200-280% compared with a mere 30-40% in developed nations[1]. Of the world's 580 million elderly (>60yrs), 355 million (61%) live in developing countries and, of these 77 million (22% of total) live in India[2]. Population of elderly Indians has increased from 5.6% (51 million) in 1961 to 7.1% (71 million) in 2001. Furthermore, speed of ageing is rapid in India. It took 120 years for elderly population in Britain to double from 7-14%, whereas in India doubling occurred in 25 years.

Caring for this increasing elderly population can be challenging as 90% of elderly Indians are from unorganized sector with no social security at the age 60, 40% of older person live below poverty line and another 33% just marginally over it, 80% live in rural areas, 73% are illiterate, 55% of women over 60 are widows[3].

Hypertension in elderly

Hypertension is common in older men and women. Diastolic Hypertension is diagnosed in the elderly if the diastolic blood pressure is at least 90mm Hg or more on three occasions. Systolic Hypertension is diagnosed in the elderly if the systolic blood pressure is at least 140mm Hg or more on three occasions. Isolated systolic Hypertension (ISH) is diagnosed in the elderly if systolic blood pressure is at least 140mm Hg or more and Diastolic blood pressure is less than 90mm Hg on three occasions.

The overwhelming majority of people will develop Systolic hypertension before they die. In the 20 year follow up of those patients enrolled in the Framingham heart study who remained normotensive at the age of either 55 or 65 years, almost 90% developed hypertension after 20 years in addition to the 20-30% of patients who are already hypertensive at 55 or 65 years of age. And 60% of patients over the age of 65 who had an elevated blood pressure had ISH[4].

Factors contributing to Hypertension in elderly

a. Progressive atherosclerosis of large capacitance vessels: Loss of distensibility and elasticity of the large capacitance vessels from atherosclerosis makes it a mere conduit without the cushion effect, resulting in progressive rise in systolic blood pressure with age. Because of the reduced caliber of these capacitance vessels, the normal drain off

into the peripheral vasculature during diastole leaves less blood filling the vessels during diastole, reducing the diastolic pressure in them. Hence systolic pressure progressively rises after the age of 50 whereas diastolic pressure falls.

b. Sodium Sensitivity: With fewer functioning nephrons, elderly people with hypertension are more sodium sensitive.

c. Renin status in elderly: Elderly people are more responsive to diuretics and calcium channel blockers and less responsive to beta blockers or ACE inhibitors or ARBS. This is because of their low renin status. Low renin production in elderly is due to reduction in JG cells as a result of benign nephrosclerosis of aging and hypertension.Elderly patients have a tendency to retain sodium and volume expansion due to reduced nephron number with aging which also results in decreased renin release from JG cells.

d. Life style, obesity (particularly the ratio of fat to body mass) plays a role in pathogenesis of hypertension.

e. Alcohol consumption exceeding 3-7 units / day is also a factor contributing to hypertension.[8]

Risk associated with Hypertension in elderly

Hypertension, whether purely systolic or combined systolic and diastolic, poses a major risk to elderly people in terms of mortality, but even more so for

morbidity[5]. Hypertension remains the major risk factor for stroke, heart failure and coronary disease in elderly patients, assuming an even greater role than it does in younger people. Whereas diastolic blood pressure is the best predictor of coronary risk in those under age 50, systolic pressure and even more, pulse pressure become the major indicators after age 60[6]. Various short course randomized controlled trails have documented that the value of antihypertensive therapy in degree of protection against major cardiovascular events is greater in elderly patients than in younger patients.

The reason is that the inherently greater pretreatment risk status of elderly people provides a greater opportunity for the benefits of blood pressure reduction to be seen than among lower risk younger patients.

Table 1: Increment in risk of cardiovascular events in patients with hypertension: 36- year follow up of the framingham study[6]

Age (years)	All CV events		Coronary heart disease		Stroke		Congestive heart failure	
	Men	Women	Men	Women	Men	Women	Men	Women
35-64	18	9	14	6	3	2	3	2
65-94	43	30	27	17	12	11	11	9
Risk Ratio (65-94/35-64)	2.4	3.3	1.9	2.8	4.0	5.5	3.7	4.5

Diabetes in Elderly

Diabetes is now evolving as a major cause of disability in older age groups. Nearly half of all diabetics are over 65 years and 10-25% of older people (>65 years) worldwide are affected with Diabetes. [9] National Health and Nutritional Examination survey (NHANES) III showed that the prevalence rate of Diabetes has increased by 1-2% in 20-39 years whereas 18-20% in 60-74 years.

In India a similar scenario is emerging where DESI, an urban study reported prevalence of diabetes among people aged over 60 years as 28.1% and IGT as 17.3%[10]. The prevalence of diabetes in rural elderly population of South India (over 60 years) is 13.4%.[11]

Table 2: Prevalence of diabetes and IGT in the elderly[10]

Age	Diabetes		IGT	
	N	%	N	%
60	508	28.1	301	17.3

Factors Contributing to Diabetes in Elderly

After the age of 30-40 years, the plasma glucose starts increasing gradually. Fasting plasma glucose increases by 1-4mg/dl per decade and 2 hour postprandial plasma glucose increases by 8-20 mg/dl per decade. The exact pathogenesis of

diabetes in elderly is not well-known. Whether this glucose tolerance is part of ageing process or is it the emergence of true diabetes has been a source of debate.

Though ageing may have a direct effect, deterioration of glucose tolerance is not always an inevitable consequence of aging[12]. With advancing age lean body mass decreases and percent adiposity increases, but there may be little or no change in body weight. Ageing is also associated with sarcopenia, causing inability in disposing glucose. Weight gain of elderly due to reduced physical activity and reduced metabolically active lean tissue contributes to insulin resistance. Also insulin secretion decreases with age due to age related Beta cell apoptosis.

Risk associated with Diabetes in elderly

Although diabetes is listed as the sixth leading cause of death among the elderly, it is a much more common contributor to morbidity and mortality in this age group, because it is a contributing factor to many deaths that are caused by cardiovascular disease. Older people who have diabetes have twice the mortality of age matched controls who do not have diabetes[12]. The principle killer is macrovascular disease. Older patients who have diabetes have a much poorer self rated quality of life. They also use hospital days and outpatient services at twice the rate of older people who do not have diabetes[13].

The risk of microvascular and macrovascular complications and heart failure is increased in old patients who have diabetes relative to age matched controls[14].

The risk of these complications increase with the age of the patient and the duration of the diabetes.

The risk that severe or fatal hypoglycemia will occur with oral agents or insulin increases exponentially with age[14]. The reasons for increased frequency of hypoglycemia in this age group are impaired secretion of counter regulatory hormones and reduced awareness of autonomic warning symptoms. [15,16]

Table 3: Hypertension and Diabetes in elderly

Hypertension in elderly	Diabetes in elderly
a. Atherosclerosis of large capacitance vessels b. Sodium sensitivity c. Low renin status d. Life Style e. Obesity	a. Decreased Insulin secretion – β cell apoptosis b. Impaired glucose disposal both insulin & non insulin mediated – insulin resistance & sarcopenia c. Increased counter regulatory hormones d. Less physical activity e. Diabetogenic drugs

Other risk factors for cardiovascular events

Dyslipidemia

A National Heart, Lung and blood institute workshop analyzed data from 25 populations and reported that serum total cholesterol and low density lipoprotein

cholesterol levels predicted fatal coronary heart disease in both men and women over 65 years of age[17]. In contrast, cholesterol level does not appear to predict stroke. This may be because it comprises both hemorrhagic and thrombotic events and cholesterol level may relate in different ways to these processes. The Scandinavian simvastatin survival study, a secondary prevention trial, reported a relative reduction of 39 and 20% in major coronary events and 37 and 27% in total mortality for those aged under 60 years and those aged 60 years and over respectively.

Smoking

Smoking is an important cardiovascular risk factor.The relative risk for coronary heart disease and stroke for men and women aged 65 years and over who smoke are about 1.5. Stopping smoking even at older ages is associated with improvement in survival. Jaijich et al reported that current smokers aged 65-74 years had 50 percent excess coronary heart disease mortality; ex- smokers had rates similar to non-smokers[18]. The CASS study also reported the decrease in relative risk of MI in patients who stop smoking. [19]

Alcohol

Alcohol has a more complex relationship with cardiovascular disease and risk factors. Alcohol intake increase systolic blood pressure by about 1mm Hg per daily unit (about 10g), but also increases HDL. While an alcohol intake of about 1-2

units/day appears protective for coronary heart disease and possibly stroke, the risk of hypertension and stroke is increased with higher levels of alcohol intake.[20]

BMI in elderly

In elderly, the relationship between mortality and body weight is a J shaped curve with increased mortality at low and high BMIs. Most evidence suggests that BMI which is associated with maximum life expectancy increases with age. For young adults, BMI associated with greatest life expectancy are in the range of 20 to 25 kg/m2 whereas in elderly the lower end increases to about 22 to 23kg/m2 and the upper end to 27 to 28 kg/m2. [21-23] The deleterious effect of being underweight are amplified by increasing age.[24]

On an average, body weight and BMI increases throughout adult life until about age 50 to 60 years, after which they decline[25]. Also there is progressive increase in fat and decrease in fat-free mass (mainly loss of skeletal muscle) causing a loss of upto 3kg of lean body mass per decade after age 50 years. Also the greater proportion of body fat in older people is intrahepatic, intramuscular and intraabdominal (vs subcutaneous) [26]. This increase in body fat is due to decreased physical activity, reduced growth hormone secretion, declining sex hormones action and reduced resting metabolic rate and thermic effect of food.

Macrovascular and Microvascular Complications

Heart Disease and Aging

CAD is the most common cause of death in older persons and was present in 43% of 1160 men and in 41% of 2464 women, mean age 81 years[27]. The percentage of MI cases that were clinically unrecognized is high[28].Hypertension was present in 60% of these older women and in 57% of these older men. The prevalence of valvular aortic stenosis, aortic regurgitation, mitral regurgitation and mitral annular calcium increases with age .The prevalence and incidence of CHF increases with age[29]. CHF is the most common cause of hospitalization in persons aged 65 yrs and above. The prevalence of normal LV ejection fraction associated with CHF increases with age and is higher in older women that in older men. The prevalence of chronic atrial fibrillation increases with age and is an independent risk predictor of new coronary events and thromboembolic stroke in older persons[30].

Cerebrovascular events in elderly

Stroke is not only one of the leading causes of death in developed countries but is also a major cause of disability leading to impaired quality of life particularly for elderly people. The incidence rates rises steeply with age in all populations, being 11 to 97 per 100,000 in men and 8 to 55 per 100,000 women aged 35 to 44 years, but 231 to 639 per 100,000 in men and 111 to 434 per 100000 in women

aged 55 to 64 years[31]. And the major treatable risk factors for stroke are hypertension, impaired glucose tolerance, smoking, dyslipidemia and obesity.

Peripheral vascular disease in the elderly:

Peripheral vascular disease (PVD) refers to atherosclerotic occlusive disease of the arterial system distal to the aortic bifurcation, and is a relatively common disorder in the elderly.[32] The American Heart Association estimates that as many as 8 to 12 million Americans have PVD and that nearly 75 percent of them are asymptomatic.[33] The prevalence of lower-extremity PVD based on ankle brachial blood pressure ratios is approximately 10 to 20 percent in community-dwelling individuals aged 65 and older and 18 to 29 percent in patients aged 50 and older in general medical practices.[34-36] The disease spectrum ranges from mild intermittent claudication to severe chronic leg ischemia requiring arterial bypass or amputation. Risk factors associated with PVD include older age, cigarette smoking, diabetes mellitus, hypercholesterolemia, hypertension, and (possibly) genetic factors.[32] Over a 5-year period, 25 to 35 percent of persons with PVD will suffer a myocardial infarction or stroke and an additional 25 percent will die, usually from cardiovascular causes.[37-38]

Screening may be conducted by instruments such as history-taking, questionnaires, or the ankle brachial index. The American Diabetes Association currently recommends annual screening for PAD in people with diabetes that includes a history of claudication and palpation of pedal pulses.[39]The American

Academy of Family Physicians recommends against the use of Doppler or duplex ultrasound or other vascular laboratory tests in asymptomatic persons for PAD.[40]

Peripheral neuropathy in elderly

Approximately one in five adults over age 60 is affected by peripheral nerve dysfunction.[41] Recent studies comparing elderly patients diagnosed with lower extremity peripheral neuropathy with a control group of non-neuropathic elders over a 1 year period found that the patients with peripheral neuropathy had a fourfold higher incidence of falls.[42-43] Although aging itself may be a contributor, it is not an invariable and sufficient cause, because 46% of patients ≥85 years old had no deficits in the study of James et al. [44] The study also showed that most common deficit was loss of ankle reflex followed by loss of fine touch. Only 40% of those with bilateral deficits reported having a disease known to cause peripheral neuropathy. Deficits were associated with numbness, pain, restless legs, trouble walking, trouble with balance, and reduced quality of life. Common causes of peripheral neuropathy include diabetes mellitus, alcoholism, nutritional deficiencies, infections, malignancies, and autoimmune diseases. Seven specific assessment tools assist the clinician in the neurologic evaluation: assessment of gait and posture, muscle tone and strength, foot deformities, position sensation, unipedal stance, vibratory sensation and ankle jerk.

Kidney disease in elderly

Elderly patients have the highest incidence rates of ESRD and the proportion of this population undergoing long-term dialysis is increasing. [45,46] Chronic kidney disease has been shown to be associated with significant increase in mortality and morbidity even in early stages. Early referral to a nephrologist, or to a multidisciplinary team specializing in ESRD care, has been associated with a reduction in health care costs, morbidity and mortality in patients starting renal replacement therapy.[47-51] Such timely referral requires early detection of kidney disease, and in this respect the most common screening test for renal dysfunction is the serum creatinine.[52] Unfortunately, serum creatinine alone may be misleading when evaluating renal dysfunction. In elderly patients, because of low muscle mass, malnutrition and other chronic disease, the serum creatinine may be within normal limits with an abnormal GFR. More accurate estimates of renal function can be obtained in clinical practice by measuring creatinine clearance from a timed urine collection or by using formulas, such as the Cockcroft and Gault formula (C-G), to calculate the glomerular filtration rate (GFR). [52]

PATIENTS AND METHODS

Patients aged 60 years and above, admitted to the medical wards of Government Stanley Medical College Hospital with either hypertension or diabetes mellitus or both were taken up for the study.

These patients were evaluated for the presence of cardiovascular risk factors and target organ damage. The period of the study was from February 2007 to May 2008. Ethical Committee approval was obtained for the study.

EXCLUSION CRITERIA

- Patients aged less than 60 years
- Patients aged 60 years and above with no hypertension or diabetes were excluded from the study.

The following data were collected and analysed.

1. Age, Sex, IP No
2. Details of Hypertension and Diabetes mellitus.

   If the patients were already known to have hypertension or diabetes, the details of its duration, drugs taken, drug compliance, hypertension and diabetes control achieved were noted.

If the patients were found to have hypertension or diabetes only in current admission, then hypertension is classified according to JNC VII staging system and diabetes diagnosed if fasting blood sugar is ≥ 126mg/dl or post prandial blood sugar is ≥ 200 mg/dl.

The reason for detection of hypertension or diabetes was noted for all patients as, whether detection was part of a screening before target organ damage or a part of workup for target organ damage.

3. Other cardiovascular risk factors such as smoking, alcoholism, obesity and central obesity, dyslipidemia, and their occupation were noted.

Obesity is defined in terms of BMI >30 and central obesity is diagnosed if the patient waist circumference is ≥ 90cm for males and ≥ 80cm for females (as per International Diabetes Foundation criteria for central obesity in south Asian). Patient's occupation is taken as the measure of their physical activity. And their occupation is classified according to Registrar – Generals occupational classification in England and Wales as follows.

I	Professional
II	Intermediate occupation
III N	Non manual skilled
III M	Manual skilled
IV	Partly skilled
V	Unskilled

4. Complication Profile

Patients were assessed for the symptoms and signs of target organ damage and the relevant laboratory investigations were done to confirm it.

Cardiac Complications: Patients were assessed for the symptoms and signs of coronary artery disease and classified as having stable angina, unstable angina, myocardial infarction and cardiac failure. Electrocardiogram, chest radiograph and echocardiography were done in all patients.

Cerebrovascular Complications: Symptoms and signs of cerebrovascular events were asked for in the patients and when needed CT brain was done.

Peripheral Vascular Disease: Symptoms like claudication pain were asked for and signs such as absent pulses, arterial ulcer, trophic changes, gangrene and amputation were looked for. Ankle brachial pressure index measurement was not done in all patients. Doppler was done in those patients with signs and symptoms.

Peripheral Neuropathy: Symptoms like paresthesia, impaired sensation, motor weakness were asked for and signs such as trophic changes, ulcer, amputation, diminished deep tendon reflexes and sensory impairment were looked for.

Renal Disease: Patients were assessed for signs and symptoms of renal failure. Blood urea,serum creatinine and spot urine albumin values were procured for all patients. Ultrasonogram of the abdomen was done only in those patients with serum creatinine > 1.5mg/dl. Glomerular filtration rate was calculated using Cockcroft-Gault formula and the patients were analyzed for the presence of chronic kidney disease.

We were not able to do a routine fundus examination for retinopathic changes as all the patients had cataract changes obliterating the fundal view.

5. Socio-Economic Details

Details of patients' marital status, monthly income , pension, details and care-taker were collected.

6. Other Co-morbid Illness

Not all co-morbid diseases were looked for and evaluated. Associated respiratory diseases alone were assessed as most of the patients had an associated chronic obstructive pulmonary disease or bronchial asthma.

7. Medical Ward Admission Details

Details of current and past medical admissions were noted. The frequency of admission to medical wards and the reasons for admission were analyzed.

RESULTS

A total of 75 patients aged 60 years and above admitted to the medical wards of Government Stanley Medical College Hospital with either hypertension or diabetes mellitus or both were analyzed. 50% of the patients belonged to the age group of 60 – 75 years. Mean age was 68 years and the age range 60 – 88years. There were 45 males and 30 females with a male to female ratio of 1.5:1 (Table 4).

Table 4: Age and Sex Distribution

Age(Yrs)	Male	Female	Total
60-64	12	7	19
65-69	15	8	23
70-74	9	8	17
75-79	6	5	11
80-84	1	2	3
≥85	2	0	2
Total	45	30	75

Mean Age ± SD	68±6 years
Male: Female ratio	1.5:1

Risk factors distribution

1. Hypertension and Diabetes Mellitus

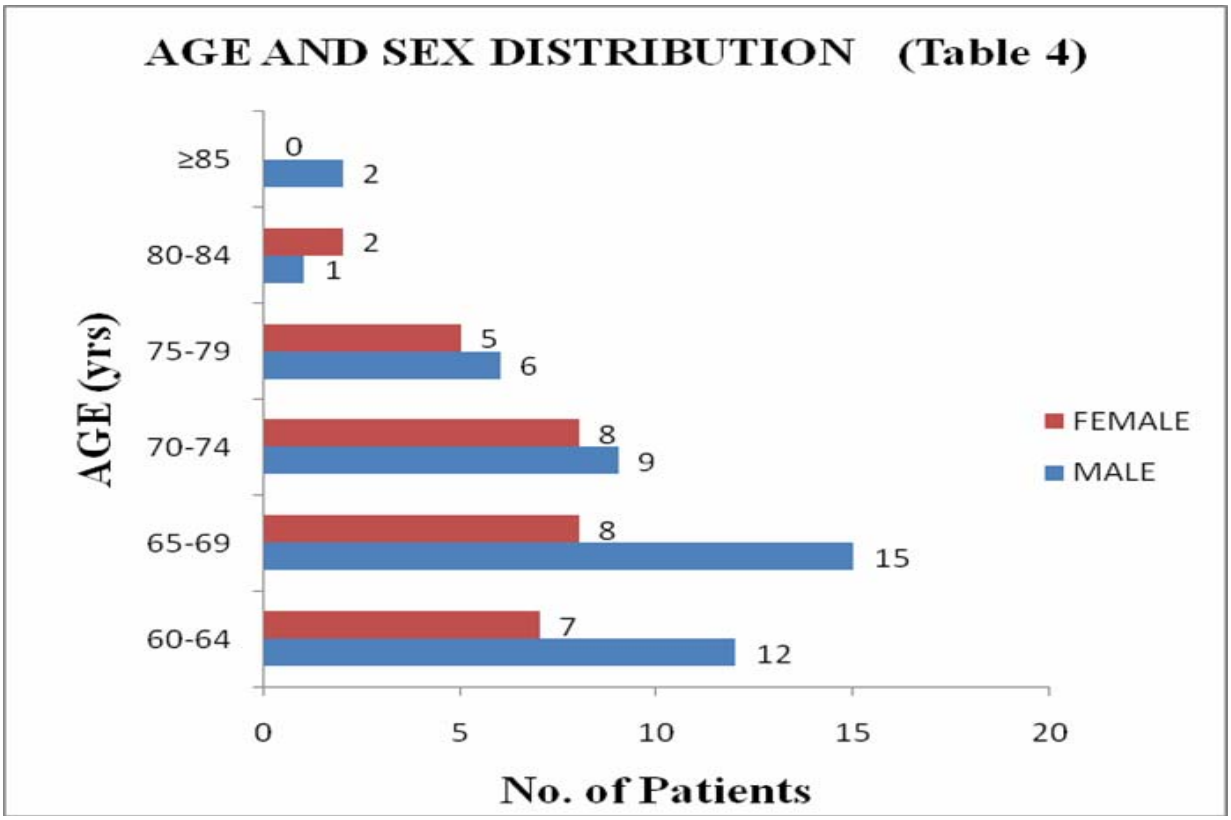
Out of the 75 patients, 31 (41.3%) had Hypertension alone, 12 (16%) had Diabetes mellitus alone and 32 (42.6%) had both Hypertension & Diabetes (Table 5).

Table 5: Distribution of Hypertension and Diabetes

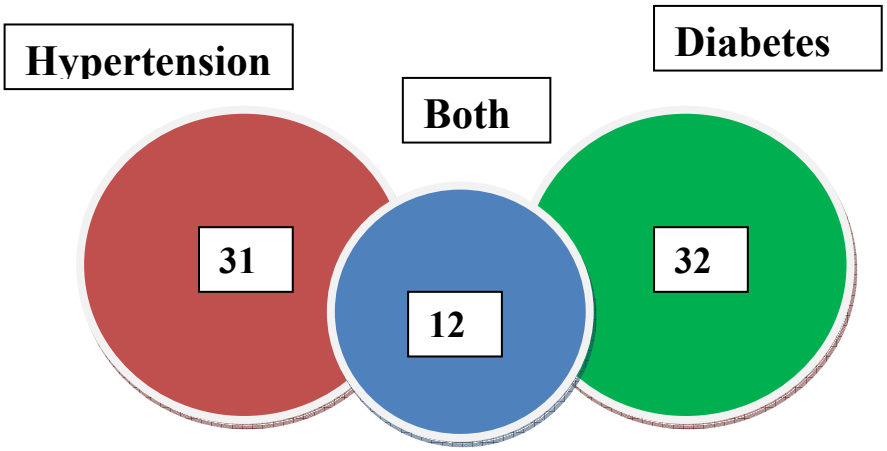
Age(Yrs)	HT Only	DM Only	Both HT & DM
60-64	5	3	11
65-69	8	6	9
70-74	9	2	6
75-79	8	1	2
80-84	1	0	2
≥85	0	0	2
Total	31	12	32

Elderly Hypertensives

Totally 63 (84%) patients were Hypertensives out of the 75 patients analyzed. 44 (69.8%) were known Hypertensives and 19 (30.1%) were newly detected Hypertensives. Only 3 (4.8%) patients had Isolated Systolic Hypertension(ISH).



DISTRIBUTION OF HYPERTENSION AND DIABETES (TABLE 5)



The average duration of hypertension in the known hypertensive patients was 3.4 years (Range 1 month – 20 years). The duration of hypertension was 1- 10 yrs in 84% of the patients (Table 6).

Table 6: Duration Of Hypertension

Duration in Years	No of patients (%)	
<1	3	(6.8)
1-5	23	(52.3)
>5-10	14	(31.8)
>10-15	2	(4.5)
>15-20	2	(4.5)

Treatment Taken

20.5%, 38.6%, 31.8% and 9% were on no, one, two and three antihypertensive drugs respectively (Table 7).

Table 7: Treatment of Hypertension

Drugs	No Of Patients (%)	
No Drugs	9	(20.5)
One Drug	17	(38.6)
Two Drugs	14	(31.8)
Three Drugs	4	(9)

All the patients had poor drug compliance and poor hypertension control.

Newly Detected Hypertension

19 (30.1%) were newly detected Hypertensives. 52.6% had stage I and 47.4% had stage II hypertension (Table 8).

Table 8: Staging of Newly Detected Hypertension

JNC VII Staging	No of patients (%)	
Stage I	**10**	**(52.6)**
Stage II	**9**	**(47.4)**

Reason for detection of hypertension

Only 46 % of the patients were detected to have hypertension by screening before target organ damage. Rest of the 54% were detected to have hypertension only after target organ damage. Target organ damage responsible for detection of hypertension were Heart Failure in 19%, Stroke events in 17.5%, Acute Coronary Syndrome in 11.1% and Renal Failure in 6.3% (Table 9).

Table 9: Reason for detection of hypertension

Reason for detection	No of patients (%)	
Screening	**29**	**(46)**
Acute Coronary Syndrome	**7**	**(11.1)**
Heart Failure	**12**	**(19)**
Stroke Events	**11**	**(17.5)**
Renal Failure	**4**	**(6.3)**

Elderly Diabetics

Totally 44 (58.7%) patients were diabetics out of the75 patients analyzed. 35 (79.5%) were known diabetics and 9 (20.9%) were newly detected diabetics.

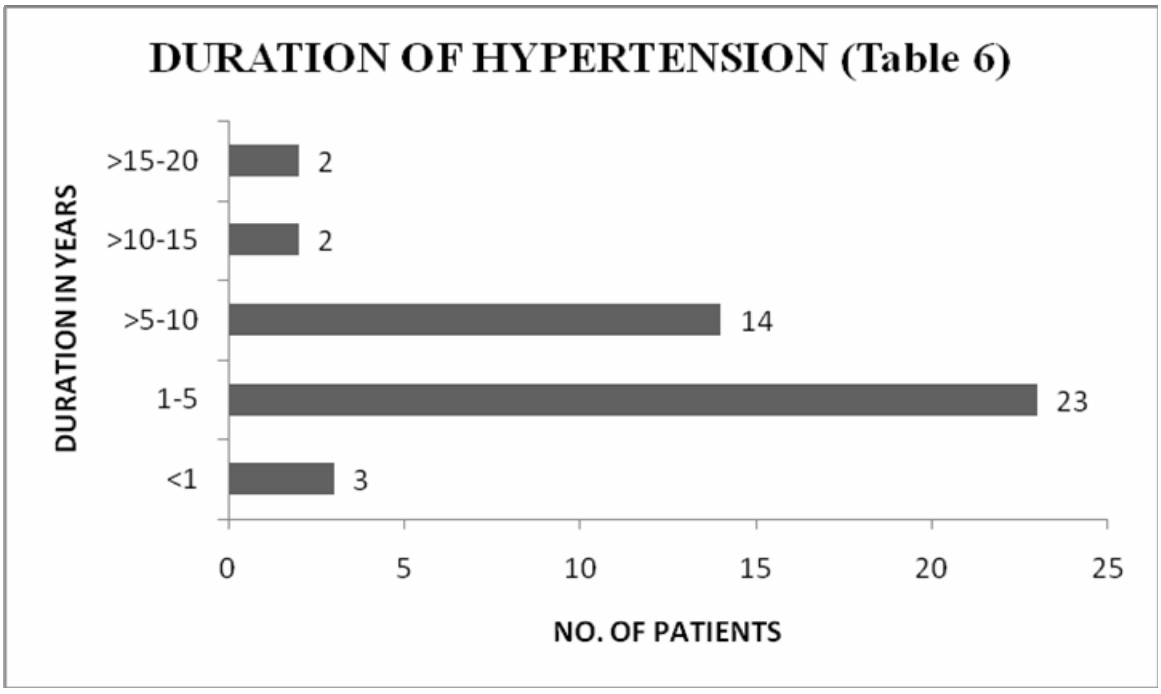
The average duration of diabetes in the known diabetic patients was 2.6 years (Range 1 month – 20 years). The duration of diabetes was 1- 10 yrs in 70.5% of the patients (Table 10).

Table 10: Duration Of Diabetes

Duration in years	No of patients (%)	
<1	6	(17.1)
1-5	15	(42.8)
>5-10	10	(28.6)
>10-15	3	(8.5)
>15-20	1	(2.9)

Treatment Taken

34.3% of patients were not on any treatment. 57.1% of patients were on oral hypoglycemic agents alone, 5.7% were on Insulin alone and another 5.7% were on both OHA and Insulin (Table 11).


DURATION OF HYPERTENSION (Table 6)
DURATION IN YEARS
>15-20
2
>10-15
2
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1-5
23
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5
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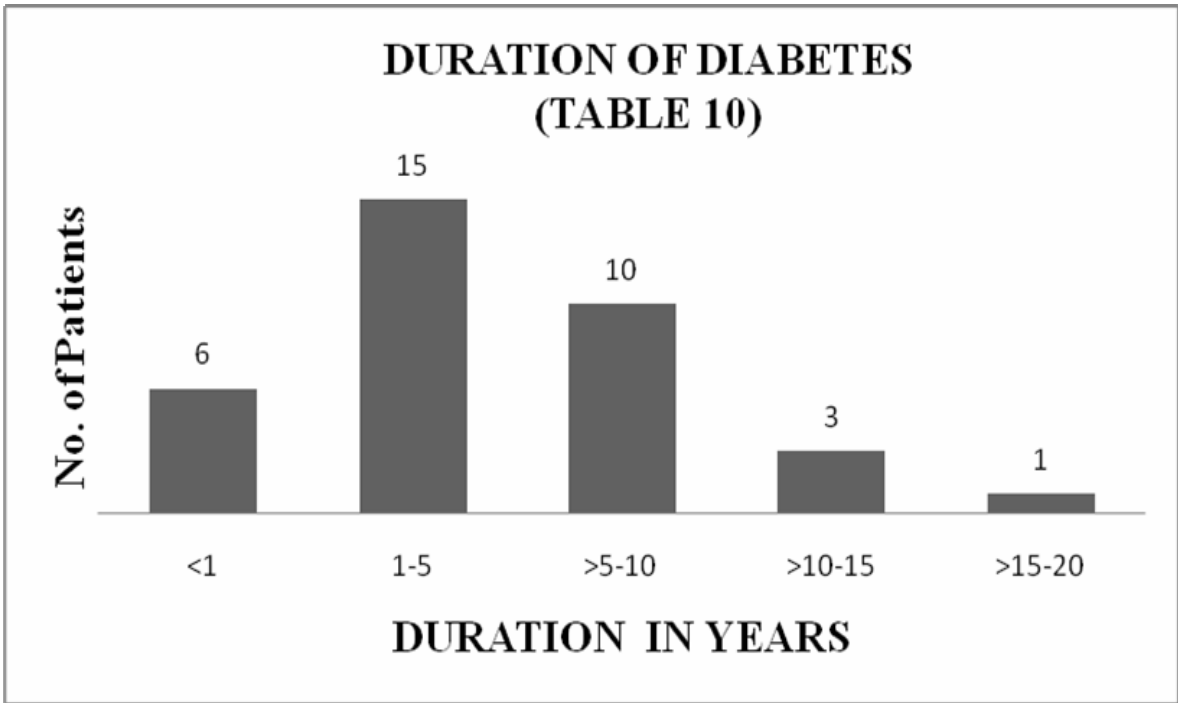
15
20
25
NO. OF PATIENTS


DURATION OF DIABETES
(TABLE 10)
No. ofPatients
15
10
6
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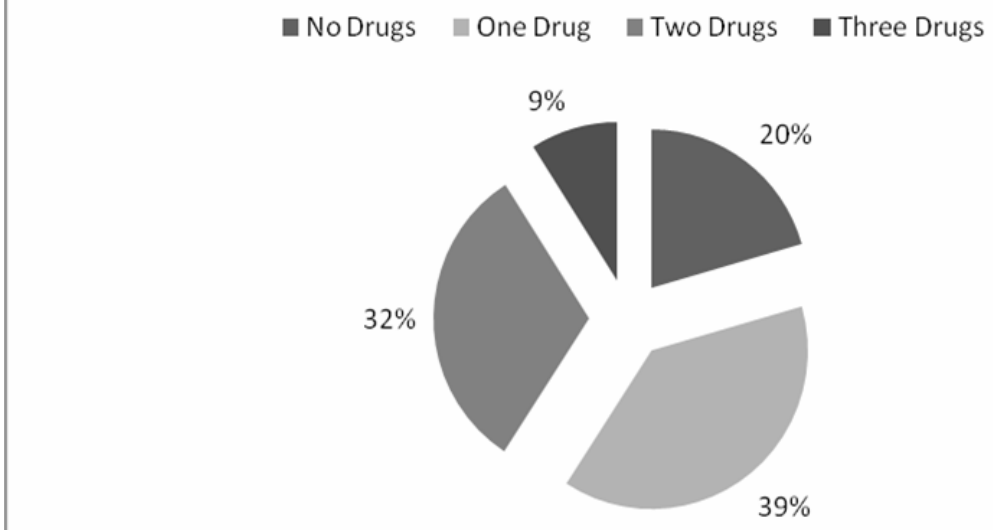
<1
1-5
>5-10
>10-15
>15-20
DURATION IN YEARS

TREATMENT OF HYPERTENSION (TABLE 7)



TREATMENT OF DIABETES (Table 11)

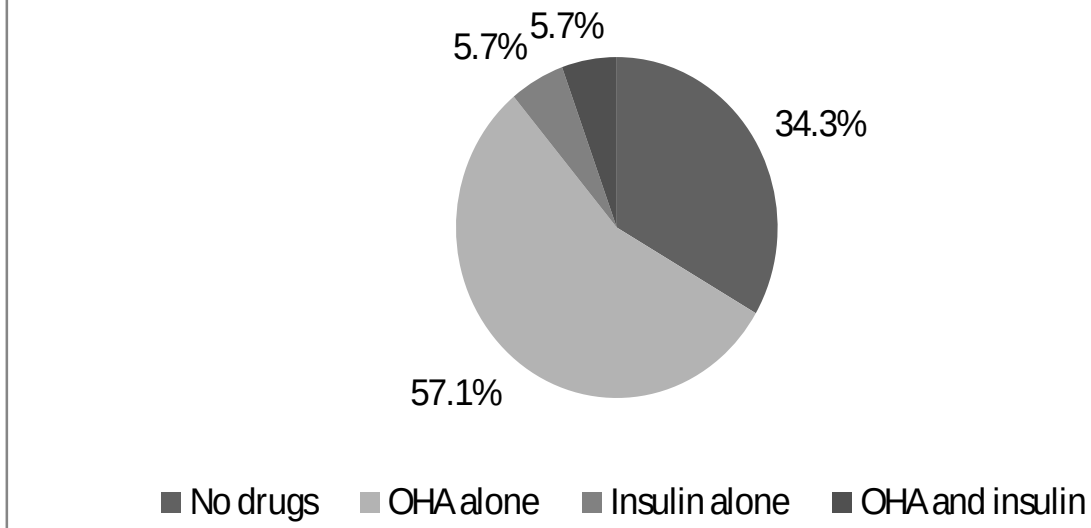


Table 11: Treatment of Diabetes

Drugs	No of patients (%)	
No drugs	**11**	**(34.3)**
OHA alone	**20**	**(57.1)**
Insulin alone	**2**	**(5.7)**
OHA and insulin	**2**	**(5.7)**

All the patients had poor drug compliance and poor Diabetes control.

Diabetes and BMI

11.3%,20.5%,45.5%and 22.7% of the diabetics(n=44) are obese, overweight, normal weight and underweight respectively.(Table 12)

Table 12: BMI of the diabetic patients

BMI	No of persons with diabetes (%)	
>30	**5**	**(11.4)**
>25-30	**9**	**(20.5)**
20-25	**20**	**(45.5)**
<20	**10**	**(22.7)**

Diabetes occurs with the odds ratio of 0.42 ,0.83 and 1.00 in underweight, normal and overweight and obese patients. But the association between diabetes and BMI is not statistically significant. (p=0.31)(Table 12 a)

Table 12 a: Correlation of BMI and diabetes

		Diabetes	
BMI	**n**	+	-
>25(overweight)	**21**	**14**	**7**
20-25(normal)	**32**	**20**	**12**
<20(underweight)	**22**	**10**	**12**

Diabetes and Central Obesity

34(77.2%) of the diabetics were centrally obese when defined by Waist Hip Ratio (WHR) (WHR>0.9 in males and >0.85 in females is central obesity). 18(40.9%) of diabetics had their waist circumference in the range of central obesity as defined by IDF.(Table 13)

Table 13: Central obesity in Diabetes patients

Central Obesity	No of persons with diabetes (%)	
WHR	**34**	**(77.2)**
WC	**18**	**(40.9)**

Odds ratio for occurrence of diabetes in centrally obese patients is 1.62(when defined by waist hip ratio) and 0.96(when defined by waist circumference).But the association between diabetes and central obesity whether defined by waist hip ratio or waist circumference is again not statistically significant.

Table 13 a: Correlation of Central Obesity (WHR) and Diabetes

		Diabetes	
Waist Hip Ratio	**n**	+	-
Centrally Obese	**55**	**34**	**21**
Normal	**20**	**10**	**10**

Table 13 b : Correlation of Central Obesity (WC) and Diabetes

		Diabetes	
Waist Circumference	**n**	+	-
Centrally Obese	**31**	**18**	**13**
Normal	**44**	**26**	**18**

Reason for detection of Diabetes

Only 65.1 % of the patients were detected to have diabetes by screening before target organ damage. Rest of the 35% was detected to have diabetes only after target organ damage. Target organ damage responsible for detection of hypertension were Heart Failure in 9.3%, Stroke Events in 7%, Acute Coronary Syndrome in 7% and Renal Failure in 7% (Table 14).

Table 14: Reason for detection of Diabetes

Reason for identification	No of patients (%)	
Screening	28	(65.1)
Acute Coronary Syndrome	3	(7)
Heart Failure	4	(9.3)
Stroke Events	3	(7)
Renal Failure	3	(7)
Infection	1	(2.3)
Metabolic Complications	1	(2.3)

2. Smoking and Alcoholism

34(75.6%) of males and1(3.3%) of females were smokers and 22(48.9%) of males were alcoholics (Table 15).

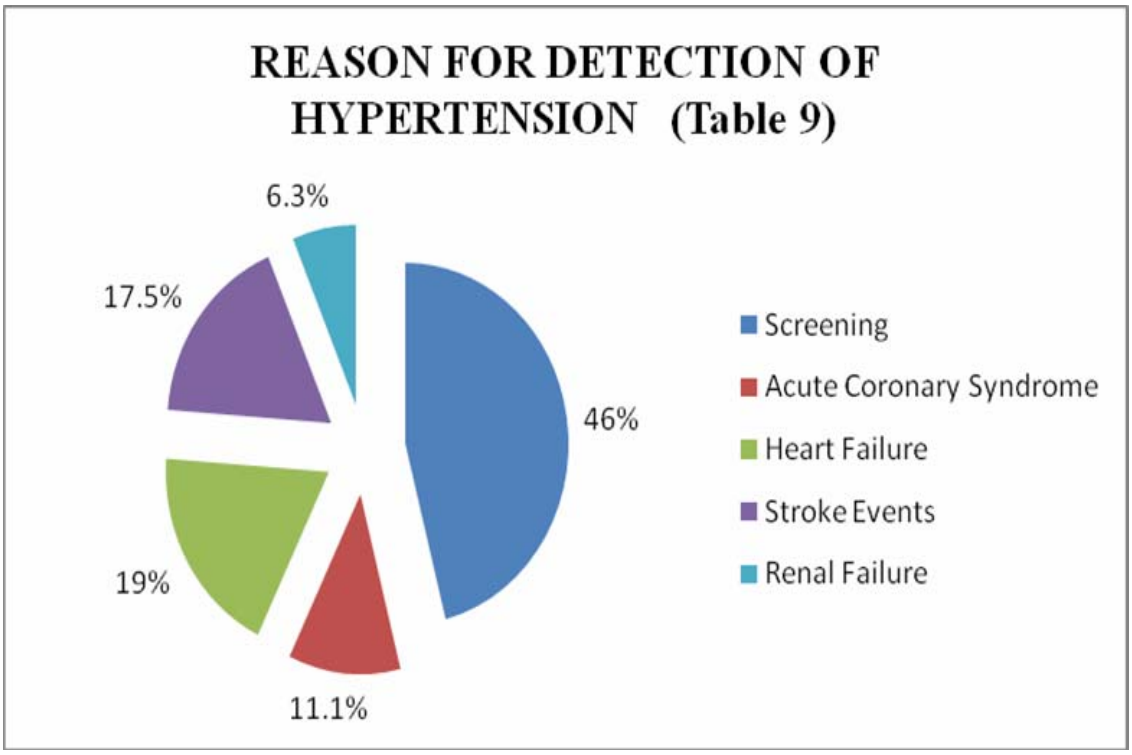
Table 15: Distribution of Smoking And Alcoholism

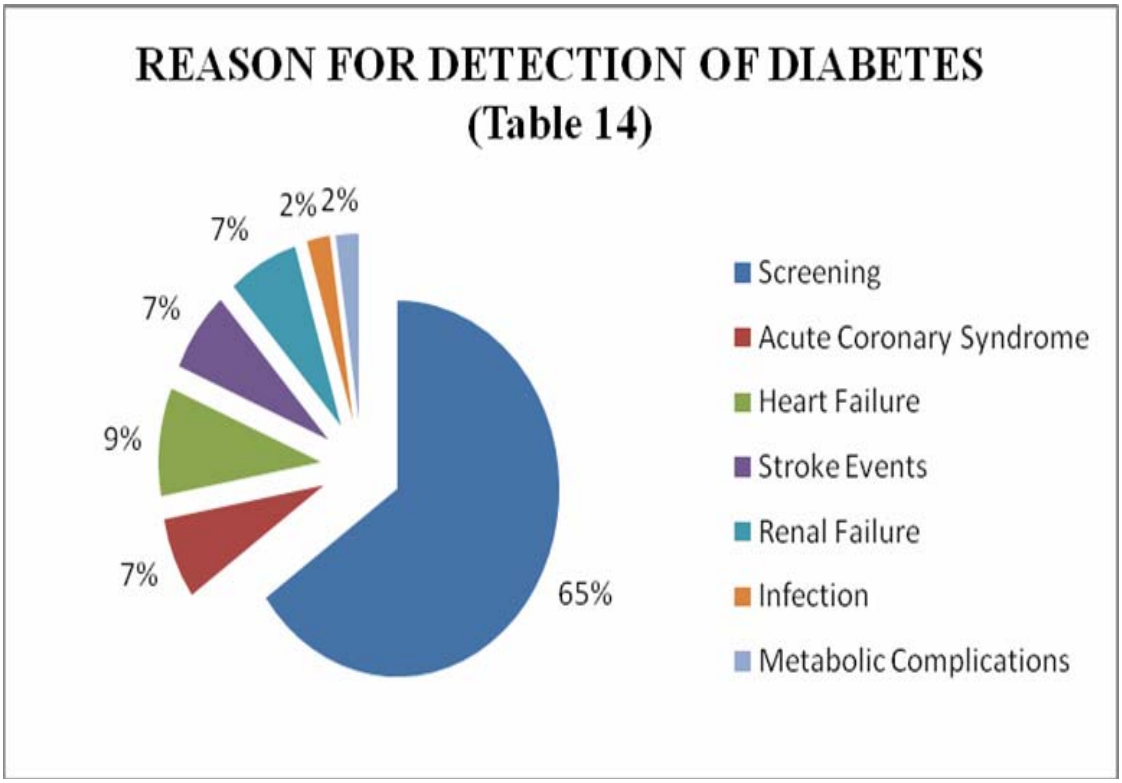
Sex	Smokers (%)		Alcoholics (%)		Both (%)		None (%)	
Male	34	(75.6)	22	(48.9)	18	(40)	7	(15.6)
Female	1	(3.3)	0	0	0	0	29	(96.7)

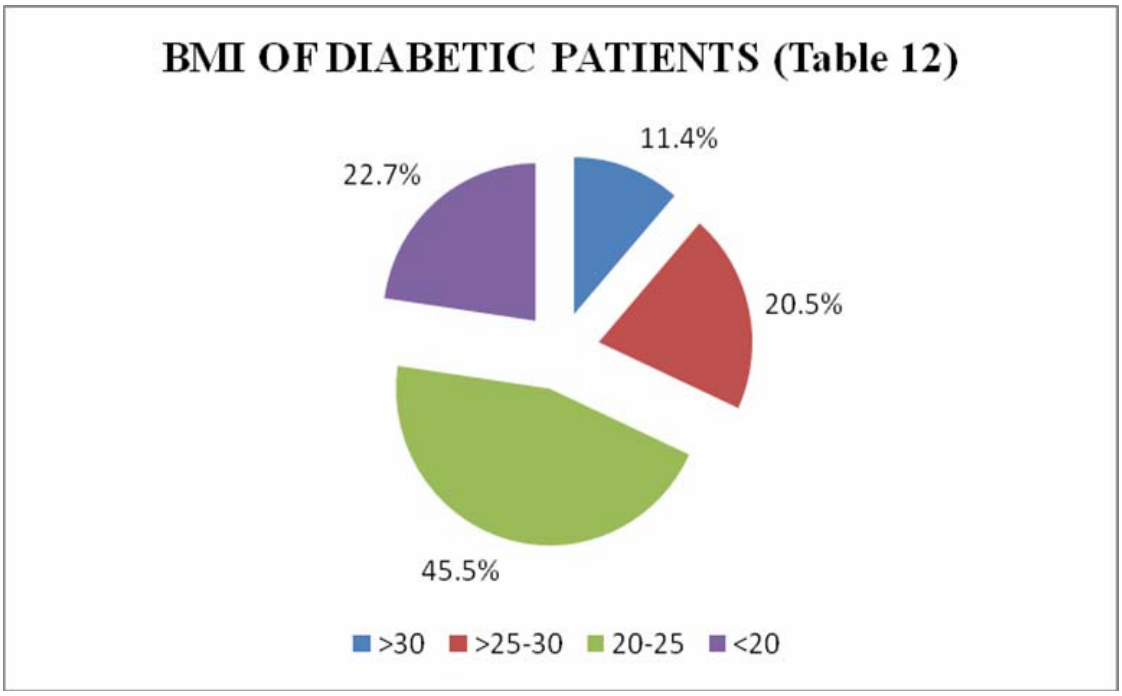
3. Obesity and central obesity

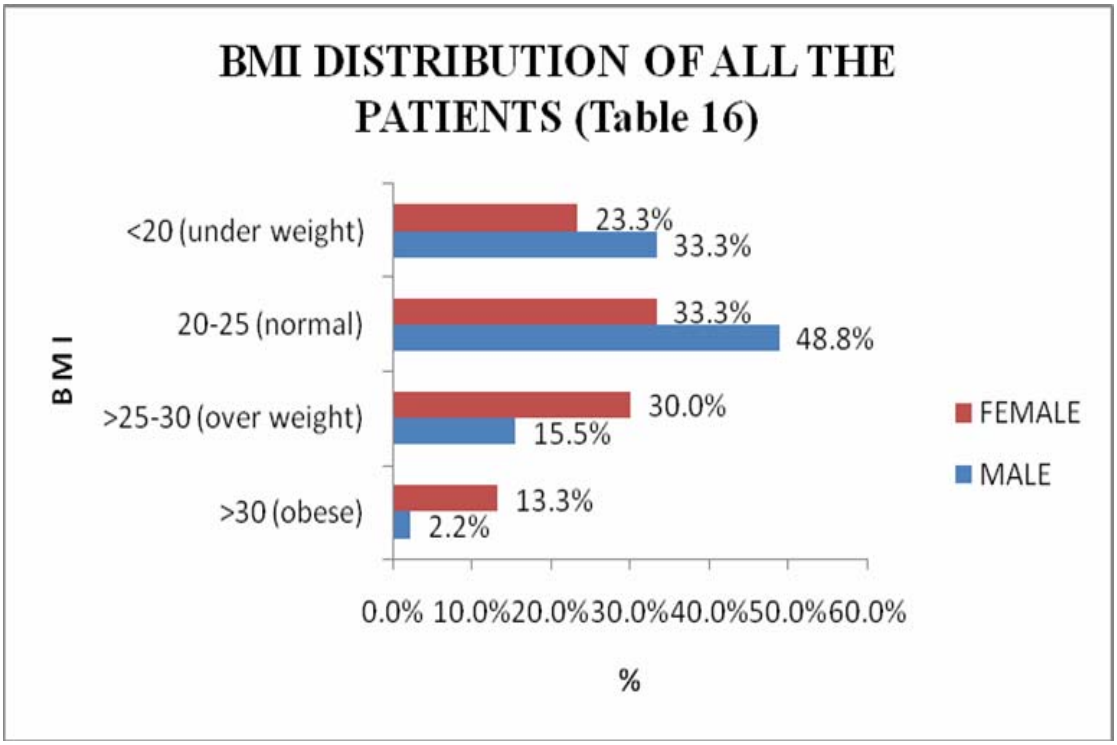
BMI distribution

Totally, 21(28%) of the patients were above the range of overweight (BMI >25). 43.3% of females compared to 17.7% of males were above the range of


REASON FOR DETECTION OF HYPERTENSION (Table 9)
6.3%
17.5%
46%
19%
11.1%
Screening
Acute Coronary Syndrome
Heart Failure
Stroke Events
Renal Failure


REASON FOR DETECTION OF DIABETES (Table 14)
2%
2%
7%
7%
9%
7%
65%
Screening
Acute Coronary Syndrome
Heart Failure
Stroke Events
Renal Failure
Infection
Metabolic Complications


BMI OF DIABETIC PATIENTS (Table 12)
11.4%
22.7%
20.5%
45.5%
>30
>25-30
20-25
<20


BMI DISTRIBUTION OF ALL THE PATIENTS (Table 16)
<20 (under weight)
20-25 (normal)
>25-30 (over weight)
>30 (obese)
23.3%
33.3%
33.3%
48.8%
30.0%
15.5%
13.3%
2.2%
BMI
FEMALE
MALE
0.0% 10.0% 20.0% 30.0% 40.0% 50.0% 60.0%
%

overweight. Interestingly 29.3% of the patients are within the range of underweight (Table 16).

Table 16: BMI distribution

BMI	Male (%)		Female (%)		Total (%)	
>30 (obese)	1	(2.2)	4	(13.3)	5	(6.7)
>25-30 (over weight)	7	(15.5)	9	(30)	16	(21.3)
20-25 (normal)	22	(48.8)	10	(33.3)	32	(42.7)
<20 (under weight)	15	(33.3)	7	(23.3)	22	(29.3)

Distribution of Central obesity

When defined by waist hip ratio alone 64.4% of males and 86.7% of females are found to be centrally obese. When defined by waist circumference alone only 26.7% of males and 63.3% of females are found to be centrally obese. When central obesity is defined by both waist hip ratio and waist circumference only 24.4% of males and 56.6% of females are falling within the range (Table 17).

Table 17: Distribution of Central obesity

WHR				WC				Both WHR and WC			
Male (>0.9)		Female (>0.85)		Male ≥90cm		Female ≥80cm		Male		Female	
29	64.4%	26	86.7%	12	26.7%	19	63.3%	11	24.4%	17	56.6%

BMI and Central obesity

76.1% of the patients with BMI above overweight were centrally obese by waist hip ratio. 81.3% of the patients with normal BMI were centrally obese by definition of waist hip ratio (Table 18)

Table 18: Correlation of BMI and central obesity

As the BMI increases, the occurrence of central obesity increases with the statistically significant association. The odds ratio for central obesity(defined by WHR) is 0.17,0.72 and 1.00 in underweight, normal and overweight and obese patients respectively. The odds ratio for central obesity (defined by waist circumference) is 0.01, 0.11 and 1.00 in underweight, normal and overweight and obese patients, respectively.

		Central Obesity (WHR)		**Central Obesity (WC)**	
BMI	**N**	+	–	+	–
>25	**21**	**18**	**3**	**17**	**4**
20-25	**32**	**26**	**6**	**13**	**29**
<20	**22**	**11**	**11**	**1**	**21**

4. Serum cholesterol

34.7% of patients had hypercholesterolemia, 30.7% had cholesterol within normal range and 21.3% had below normal value (Table 19).

Table 19: Sr.Cholesterol values of the patient

Serum cholesterol	No of patients (%)	
<150	16	(21.3)
150-200	23	(30.7)
>200	26	(34.7)

Socioeconomic Details

Occupation of the patients

93.3% of the patients are manual laborers (Table 20).

Table 20: Occupation of the patients

Type Of Occupation	No of Patients (%)	
Professional	0	(0)
Intermediate	1	(1.3)
Non Manual Skilled	4	(5.3)
Manual Skilled	50	(66.7)
Partly Skilled	19	(25.3)
Unskilled	1	(1.3)

Social Support

27 (36%) patients are widows or widowers. 76% of the patients are needed to be supported by their children (Table 21). Only 20% received either widow pension or elderly pension from the Government.

Table 21 Care taker of the patients

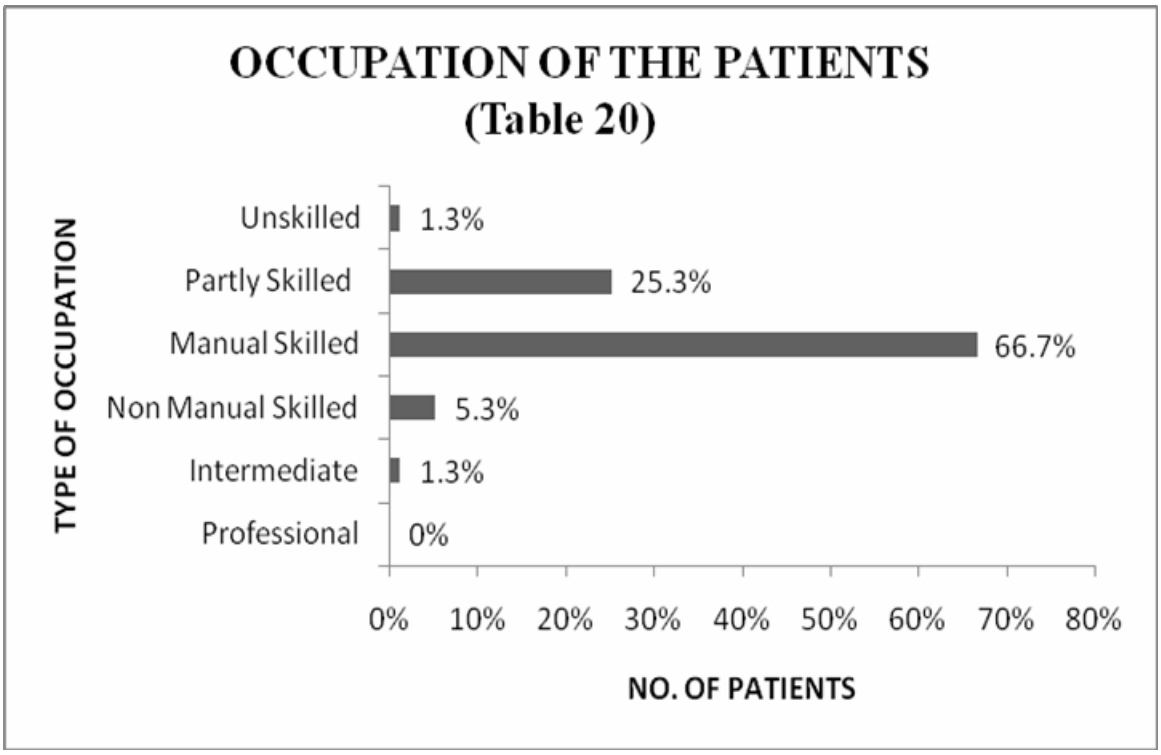
Care Taker	No of Patients (%)	
Self	8	(10.7)
Spouse	10	(13.3)
Children	57	(76)

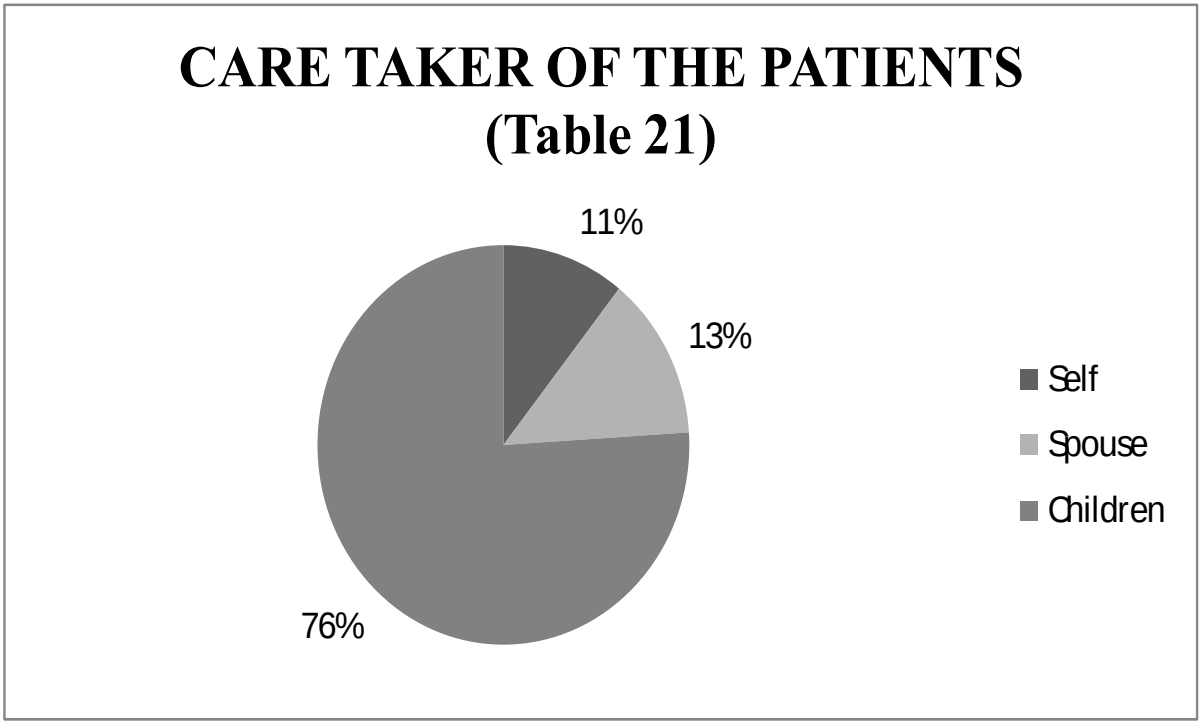
Socio Economic Background of the Family

Average monthly income of the family is Rs. 2200 ± 1500(Table 22).

Table 22: Monthly income of the family

Income (Rs)	No of Patients (%)	
≤ 1000	17	(22.7)
>1000 – 2000	33	(44)
>2000 – 3000	17	(22.7)
>3000	8	(10.7)


OCCUPATION OF THE PATIENTS
(Table 20)
TYPE OF OCCUPATION
Unskilled
1.3%
Partly Skilled
25.3%
Manual Skilled
66.7%
Non Manual Skilled
5.3%
Intermediate
1.3%
Professional
0%
0%
10%
20%
30%
40%
50%
60%
70%
80%
NO. OF PATIENTS


CARE TAKER OF THE PATIENTS
(Table 21)
11%
13%
76%
Self
Spouse
Children

Complication profile

Complication profile of our elderly diabetics and hypertensives showed that 48(64%) had cardiac complications in the form of coronary artery disease or congestive heart failure, 23(30.6%) had cerebrovascular complications, 6(8%) had peripheral vascular disease,15(20%) had peripheral neuropathy and 67(89.3%) had chronic kidney disease.

Table 23:Complication profile of the patients

Complication	No. of Patients
Cardiac	**48(64%)**
Cerebrovascular	**23(30.6%)**
Peripheral vascular disease	**6(8%)**
Peripheral neuropathy	**15(20%)**
Chronic kidney disease	**67(89.3%)**

Macrovascular Complications

Cardiac Complications

48(64%) out of 75 had cardiac events in the form of either coronary artery disease or congestive heart failure. 28%,4% and 41.3% of the 75 patients had features suggestive of stable angina, unstable angina and myocardial infarction respectively. Of the 31 patients with myocardial infarction 16(51.7%)had clinically recognized myocardial infarction. Almost half of the patients (15(48.3%)) had

clinically unrecognized(silent) myocardial infarction diagnosed by routine electrocardiogram and echocardiography screening showing regional wall motion abnormality . 5.3% of the patients had degenerative valvular heart disease. 41(54.6%) had features suggestive of cardiac failure(Table 24).

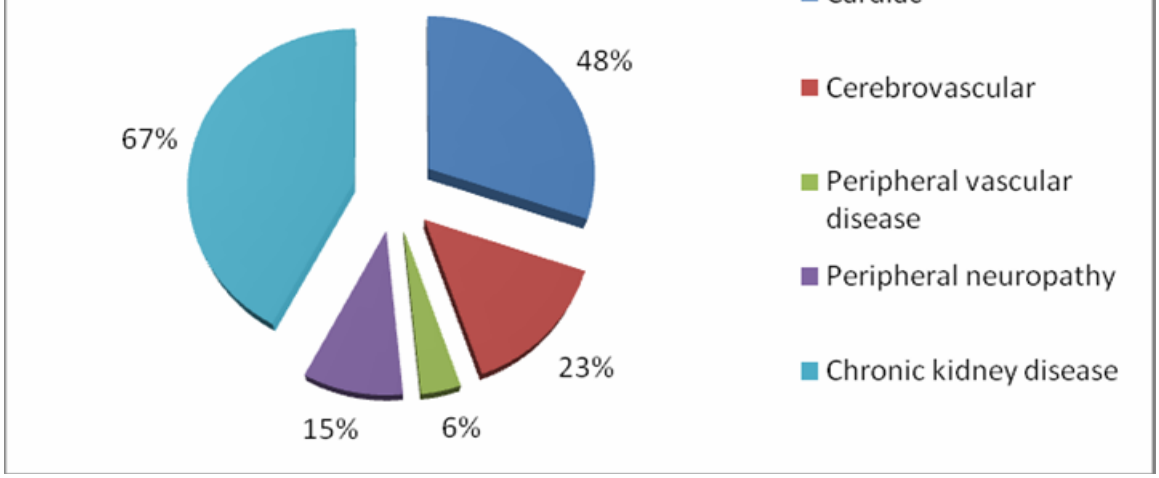
Table 24: Cardiovascular complication profile

Cardiac Events	No of Patients (%)	
Stable Angina	**21**	**(28)**
Unstable Angina	**3**	**(4)**
Myocardial Infarction (MI)	**16**	**(21.3)**
Silent MI	**15**	**(20)**
Degenerative Valvular Heart Disease	**4**	**(5.3)**
Cardiac Failure	**41**	**(54.6)**

Features of cardiac failure in elderly patients

Of the total 41 cardiac failure patients 29(70.7%) had Left Ventricular (LV) dysfunction and 12(29.3%) had cardiac failure with preserved LV function. Of the LV dysfunction patients 20.7%, 58.6% and 20.7% had mild, moderate and severe LV dysfunction respectively (Table 25).

COMPLICATION PROFILE OF THE PATIENTS (Table 23)



CARDIOVASCULAR COMPLICATION PROFILE (Table 24)

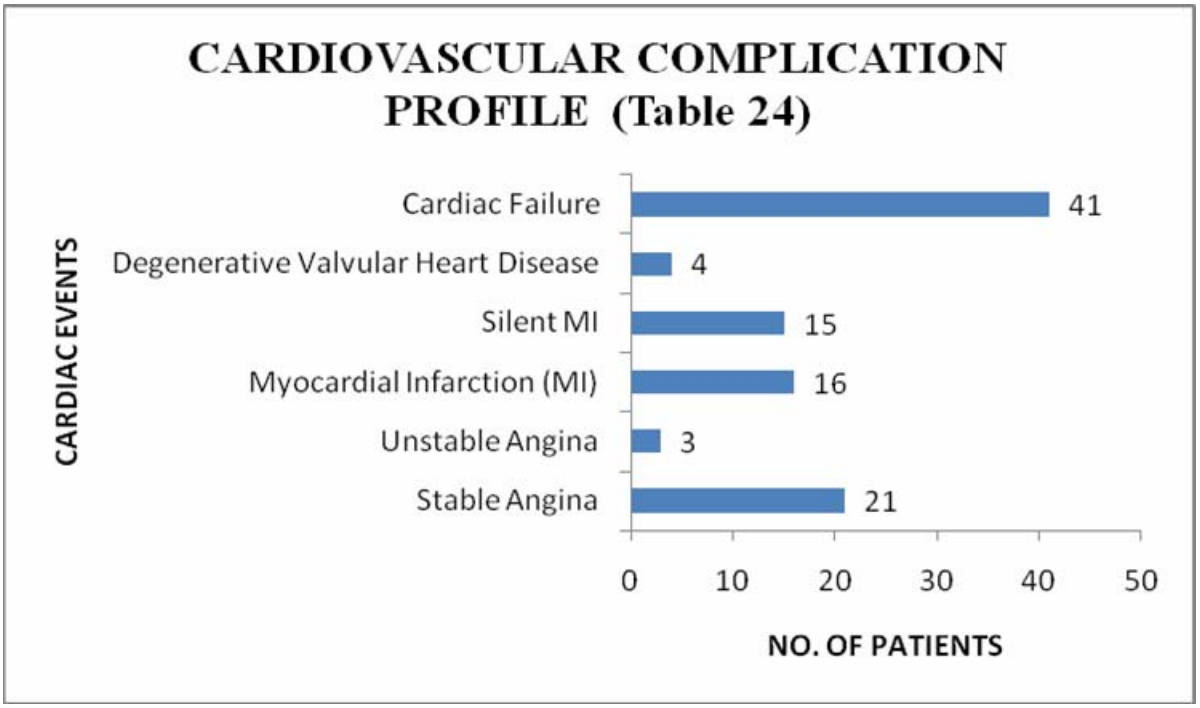


Table 25: Echocardiographic Features of Cardiac Failure Patients (n=41)

LV Function (EF)	No of Patients (%)	
Preserved LV Function	12	(29.3)
LV Dysfunction	29	(70.7)
Mild Dysfunction (>45-<60)	6	(20.7)
Moderate Dysfunction (35-45)	17	(58.6)
Severe Dysfunction (<35)	6	(20.7)

Cerebrovascular Complications

30.6% of the patients had cerebrovascular accident, out of which 78.3% were ischemic strokes and 21.7% were hemorrhagic strokes.(Table 26)

Table 26: Cerebrovascular events

Cerebrovascular Events	No of Patients (%)	
Transient Ischemic Attacks	4	(5.3)
Stroke events	23	(30.6)
Ischemic Stroke	18	(78.3)
Haemorrhagic Stroke	5	(21.7)

Peripheral Vascular Disease

6 (8%) patients had either symptoms or signs suggestive of peripheral vascular disease.

Microvascular Complications

Peripheral Neuropathy

15 (20%) patients had either symptoms or signs suggestive of peripheral neuropathy.

Renal Disease

Renal impairment by GFR

67(89.3%) of the patients were found to have chronic kidney disease (GFR <90). 29.3%, 45.3%, 12% and 2.6% of the patients were in stage 2, 3, 4 and 5 chronic kidney disease respectively (Table 24).

Table 27: Renal impairment by GFR

GFR	No of Patients (%)	
>90	8	(10.6)
60-89	22	(29.3)
30-59	34	(45.3)
15-29	9	(12)
<15	2	(2.6)

Serum creatinine as a test for renal failure

89.3% of the patients were found to have chronic kidney disease (GFR <90). Whereas if serum creatinine of >1.5 mg/dl is taken as cut off and screening is done, only 14.6% were found to have renal failure. Serum creatinine of >1.5 mg/dl has a

sensitivity of 16.4% and specificity of 100% to diagnose renal failure in patients with GFR <90ml/min. To diagnose severe renal failure in patients with GFR <30ml/min, it has a sensitivity of 90.1% and specificity of 98.4%.(Table 28)

Table 28: Serum creatinine (>1.5mg/dl) as a test for renal failure

To Detect Renal Failure (GFR <90ml/Min)	
Sensitivity	**16.4%**
Specificity	**100%**
To Detect Severe Renal Failure (GFR <30 Ml/Min)	
Sensitivity	**90.1%**
Specificity	**98.4%**

Correlation of duration of Hypertension and Diabetes with Cardiovascular Events

Duration of hypertension and diabetes and the incidence of major cardiovascular events are compared.

Duration of Hypertension and Cardiovascular Events

Majority (84%) of the patient had hypertension for the duration of 1-10 years. The number of patients with hypertension for <1 yr and > 10 yrs is very less. Totally 67 major cardiovascular events have occurred in the known hypertensives; out of which 91% (61) of cardiovascular events have occurred in the group of patients with hypertension for the duration within 1-10 years, whereas only 9% (6)

of events have occurred in the other group of patients. Since the number of patients is not equally distributed, they are not comparable. A significant result noted is that the rate of occurrence of cardiovascular events is 1per person in Newly Detected (ND) hypertensive group and the rate is 1.6 per person in known hypertensive of 1-10 year duration. Duration of hypertension appears to play a small role in the rate of occurrence of cardiovascular events.(Table 29)

Table 29: Duration of Hypertension and Cardiovascular Events

	ND n=19	<1 n =3	1-5 n = 23	>5-10 n = 14	>10 -15 n=2	>15-20 n=2
CAD	**2**	**0**	**12**	**8**	**1**	**2**
CHF	**9**	**1**	**14**	**8**	**1**	**1**
CVA	**7**	**0**	**7**	**8**	**0**	**0**
PVD	**1**	**0**	**1**	**3**	**0**	**0**
Total Events	**19**	**1**	**34**	**27**	**2**	**3**
No Events	**3**	**2**	**2**	**1**	**1**	**0**

Duration of Diabetes and Complications

Majority (70.5%) of the patient had diabetes for the duration of 1-10 years. The number of patients with diabetes for <1 yr and > 10 yrs is very less. Totally 66 major cardiovascular events have occurred in the known diabetics; out of which 71.2% (47) of cardiovascular events have occurred in the group of patients with diabetes for the duration within 1-10 years, whereas only 28.8% (19) of events have occurred in the other group of patients. Since the number of patients is not equally distributed, they are not comparable. A significant result noted is that the rate of

occurrence of cardiovascular events is 1.8 per person in Newly Detected (ND) diabetes group and the rate is 1.9 per person in known diabetics of 1-10 year duration. Duration of diabetes does not increase the rate of event occurrence. (Table 30)

Table 30: Duration of Diabetes and Complications

	ND n=9	<1 n =5	1-5 n = 15	>5-10 n = 10	>10 -15 n=3	>15-20 n=1
CAD	**5**	**3**	**8**	**5**	**3**	**1**
CHF	**3**	**3**	**8**	**6**	**3**	**1**
CVA	**3**	**1**	**5**	**2**	**1**	**0**
PVD	**3**	**0**	**2**	**1**	**0**	**0**
PN	**2**	**2**	**6**	**3**	**0**	**0**
RENAL	**0**	**1**	**0**	**1**	**0**	**0**
Total Events	**16**	**10**	**29**	**18**	**7**	**2**
No Events	**0**	**1**	**1**	**2**	**0**	**0**

Correlation of risk factors and complications

Contribution of other risk factors such as smoking, alcoholism, central obesity (with waist circumference criteria by IDF) and serum cholesterol levels in the occurrence of cardiovascular events when they are added up with hypertension and diabetes are looked for in the following tables. But there is no steady increase in events when the risk factors are added up, probably because the number of persons distributed in each cell is very less for comparison. (Tables 31, 32, 33)

Table 31: Correlation of other risk factors and complications in Patients with diabetes and hypertension (n = 32)

No of other risk factors	Male (n = 17)				Female(n=15)			
	n	Cardiac (%)	Stroke (%)	Renal (%)	n	Cardiac (%)	Stroke (%)	Renal (%)
0	2	1(50)	1(50)	1(50)	4	3(75)	0(0)	4(100)
1	4	3(75)	1(25)	4(100)	8	6(75)	2(25)	7(87.5)
2	8	7(87.5)	1(12.5)	8(100)	3	1(33.3)	2(66.7)	2(66.7)
3	3	2(66.7)	1(33.3)	3(100)	0	0(0)	0(0)	0(0)
4	0	0(0)	0(0)	0(0)	0	0(0)	0(0)	0(0)

Table 32: Correlation of other risk factors and complications in Patients with diabetes and no hypertension (n= 11)

No of other risk factors	Male (n = 9)				Female(n=3)			
	n	Cardiac (%)	Stroke (%)	Renal (%)	N	Cardiac (%)	Stroke (%)	Renal (%)
0	1	1(100)	0(0)	1(100)	2	1(50)	1(50)	2(100)
1	3	3(100)	1(33.3)	2(66.7)	1	0(0)	0(0)	1(100)
2	3	0(0)	0(0)	3(100)	0	0(0)	0(0)	0(0)
3	1	1(100)	0(0)	1(100)	0	0(0)	0(0)	0(0)
4	1	0(0)	1(100)	0(0)	0	0(0)	0(0)	0(0)

Table 33: Correlation of other risk factors and complications in Patients with hypertension and no diabetes (n = 31)

No of other risk factors	Male (n = 20)				Female(n=11)			
	n	Cardiac (%)	Stroke (%)	Renal (%)	N	Cardiac (%)	Stroke (%)	Renal (%)
0	1	1(100)	0(0)	1(100)	0	0(0)	0(0)	0(0)
1	5	4(80)	3(60)	5(100)	7	4(57.1)	3(42.9)	7(100)
2	8	3(37.5)	2(25)	7(87.5)	3	2(66.7)	1(33.3)	3(100)
3	5	3(60)	3(60)	5(100)	1	1(100)	0(0)	1(100)
4	1	1(100)	0(0)	0(0)	0	0(0)	0(0)	0(0)

Hospital Admission Details:

A total of 167 hospital admissions were reported in these patients. On an average the hospital admission rate is 0.5 per year in the study population.

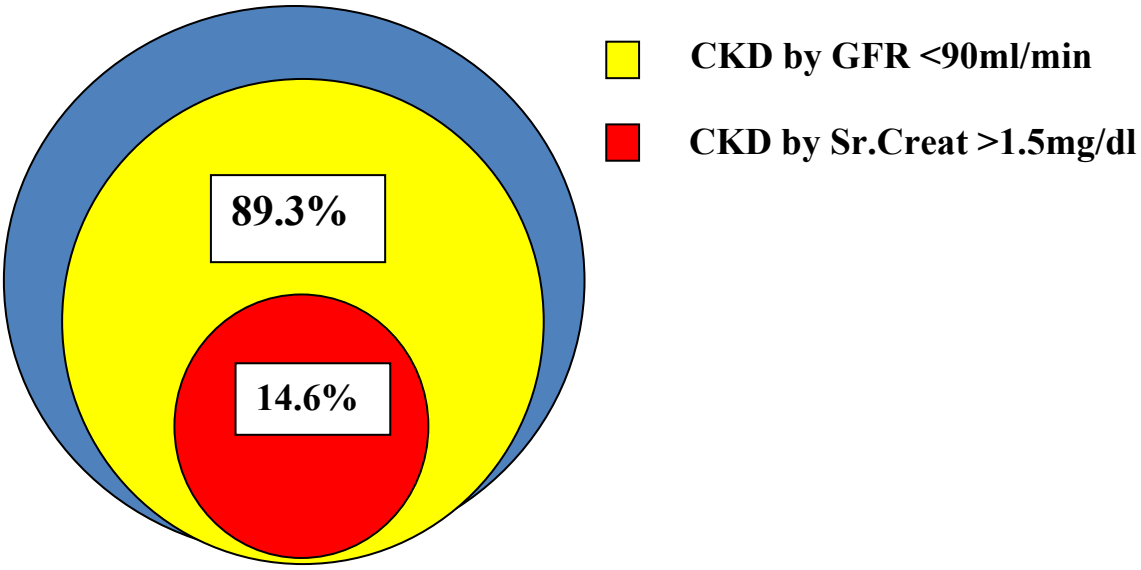
Cause for Hospital Admissions

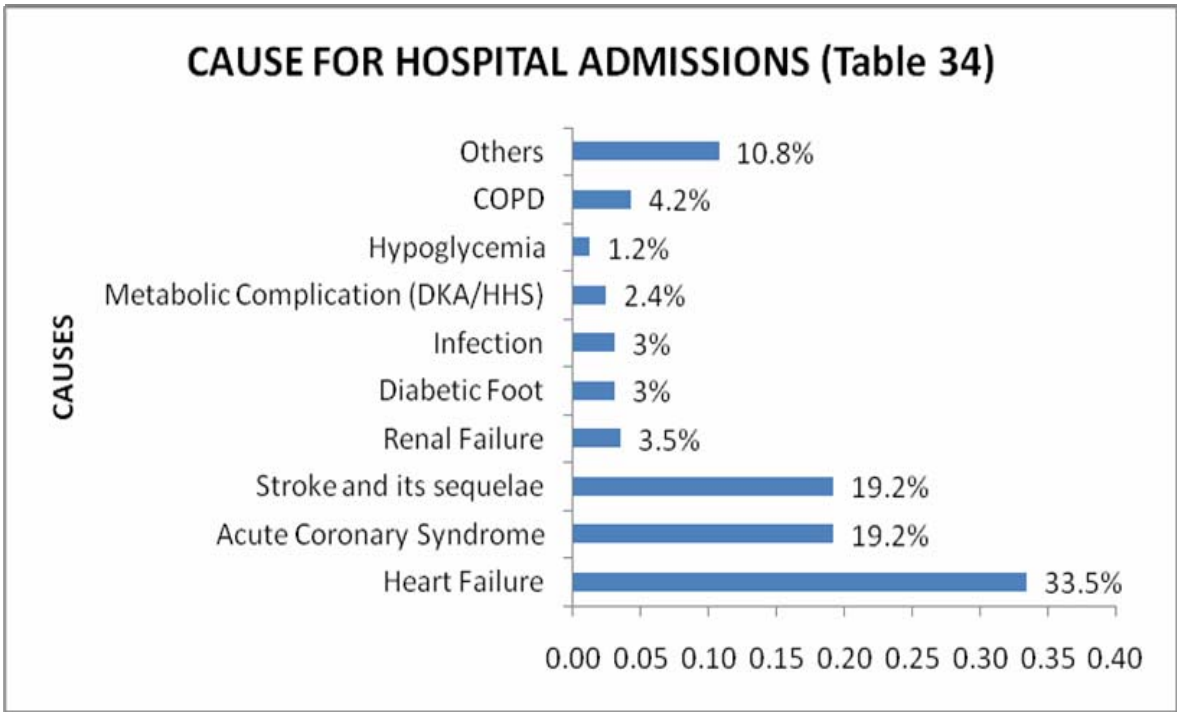
Major causes for hospital admissions were heart failure (33.5%), acute coronary syndrome (19.2%), stroke and its sequelae (19.2%), COPD (4.2%) and renal failure (3.5%).(Table 34)

Table 34: Cause for Hospital Admissions

Causes	No Of Admissions (%)	
Heart Failure	**56**	**(33.5)**
Acute Coronary Syndrome	**32**	**(19.2)**
Stroke and its sequelae	**32**	**(19.2)**
Renal Failure	**6**	**(3.5)**
Diabetic Foot	**5**	**(3)**
Infection	**5**	**(3)**
Metabolic Complication (DKA/HHS)	**4**	**(2.4)**
Hypoglycemia	**2**	**(1.2)**
COPD	**7**	**(4.2)**
Others	**18**	**(10.8)**
Total	**167**	**(100)**

RENAL IMPAIRMENT BY GFR AND SR.CREATININE (TABLE 27)





DISCUSSION

Graying of population is faster in India than many European and developed countries. The prevalence of diabetes and hypertension increase with age and they form the major risk factors for increased morbidity and mortality rates among the elderly. The clinical presentation of diabetes and hypertension in this subgroup is different from the younger group of patients and this called for this study.

A total of 75 patients aged 60 years and above, admitted to the medical wards of Government Stanley Medical College Hospital with either hypertension or diabetes mellitus or both were taken up for the study. 50% of the patients belonged to the age group of 60 – 75 years. Mean age was 68 years and the age range 60 – 88years. There were 45 males and 30 females with a male to female ratio of 1.5:1 (Table 4). All these patients belong to lower socioeconomic status with an average monthly income of the family around Rs.2200 and 93.3 % of these patients are manual laborers (Table 20,22).

Risk factor profile

Hypertension and Diabetes

Out of the 75 patients, 31 (41.3%) had Hypertension alone, 12 (16%) had Diabetes mellitus alone and 32 (42.6%) had both Hypertension & Diabetes (Table5).

Totally 63 (84%) patients were Hypertensives.Out of the 75 patients analyzed. 44 (69.8%) were known Hypertensives and 19 (30.1%) were newly detected Hypertensives.In our study, only 3 (4.8%) patients had Isolated Systolic Hypertension.

Progressive atherosclerosis of large capacitance vessels with ageing results in increase in systolic pressure and fall in diastolic pressure leading to increased incidence of Isolated Systolic Hypertension (ISH) in elderly. In the 20 year follow up of those patients enrolled in the Framingham heart study, 60% of patients over the age of 65 who had an elevated blood pressure had ISH[4]. In another Indian study by Dwivedi et al in Delhi on profile of hypertension in elderly subjects showed an incidence of 24.6% of ISH.[53] And this calls for further studies on prevalence of ISH in our country. If ISH incidence is found to be low in India, then it suggests alternative causes for hypertension in elderly Indians.

The average duration of hypertension in the known hypertensive patients was 3.4 years (Range 1 month – 20 years). The duration of hypertension was 1- 10 yrs in 84% of the patients (Table 6), probably suggesting the mortality of the individuals with hypertension of longer duration of more than 10 years, owing to the target organ damage.

In our study 20.5%, 38.6%, 31.8% and 9% of hypertensive patients were on no, one, two and three antihypertensive drugs respectively at present (Table 7). Unfortunately hypertension and its treatment fulfill many of the criteria that are known to reduce adherence to any therapy. Fewer than half of patients who begin

on antihypertensive therapy will still be taking their medication after one year. According to a survey of over 1000 patients with hypertension in England reported by Jones et al, the continuation rates at six months were between 40 – 50%, regardless of the class of antihypertensive drug prescribed.[54] In our study all the patients had poor drug compliance and poor hypertension control. This calls for general awareness among the patients about the consequences of poorly controlled hypertension and thus improving patient compliance.

In our study, totally 44 (58.7%) patients were diabetics. Out of the 75 patients analyzed,35 (79.5%) were known diabetics and 9 (20.9%) were newly detected diabetics. The average duration of diabetes in the known diabetic patients was 2.6 years (Range 1 month – 20 years). The duration of diabetes was 1- 10 yrs in 70.5% of the patients (Table 10) again suggesting that those people with diabetes of more than 10 years duration would have succumbed to the macrovascular complications. 34.3%, 57.1%, 5.7% and another 5.7% were on no drugs, OHA alone, Insulin alone and on both OHA and Insulin respectively. All the patients had poor drug compliance and poor diabetes control. The awareness among the people on the need for tight sugar control needs to be increased.

On assessing the BMI of the diabetic patients,our study showed 5(11.3%) were obese,9(20.5%) were overweight,45.5% were normal weight and 22.7% were underweight(Table 12). 34 (77.2%) of the diabetics were centrally obese when defined by waist hip ratio(WHR). (WHR >0.9 in males and >0.85 in

females).18(40.9%) of diabetics had their waist circumference in the range of central obesity as defined by IDF(Table 13)

Diabetes occurs with the odds ratio of 0.42 ,0.83 and 1.00 in underweight, normal and overweight and obese patients respectively. But the association between diabetes and BMI is not statistically significant. (p=0.31)(Table 12 a) Odds ratio for occurrence of diabetes in centrally obese patients is 1.62(when defined by waist hip ratio) and 0.96(when defined by waist circumference).But the association between diabetes and central obesity whether defined by waist hip ratio or waist circumference is again not statistically significant.(Table 13 a,13 b)

Another Indian study by Singh NP et al(n=50) showed that 18% of their elderly diabetics were obese[55].Jung ED et al study done at Daegu showed that the elderly type 2 diabetics are more centrally obese than the same weight middle aged patients [56].Our study showed no statistically significant association between BMI and diabetes or central obesity and diabetes(Tables 12a,12b).Whereas, data from NHES(National Health Examination Survey) and NHANES indicate that the prevalence of diagnosed and undiagnosed diabetes increased in the age group of 65-74 years with increasing BMI.This observation needs to be confirmed by further epidemiological studies on elderly diabetics. As of now there is no large epidemiological data available in India regarding prevalence of obesity in elderly diabetics.

Only 29 (46 %) of the patients were detected to have hypertension by screening before target organ damage. 34(54%) were detected to have hypertension only after target organ damage. Target organ damage responsible for detection of hypertension were Heart Failure in 19%, Stroke Events in 17.5%, Acute Coronary Syndrome in 11.1% and Renal Failure in 6.3%(Table 9). Only 28(65.1 %) of the patients were detected to have diabetes by screening before target organ damage.16(35%) were detected to have diabetes only after target organ damage. Target organ damage responsible for detection of hypertension were Heart Failure in 9.3%, Stroke Events in 7%, Acute Coronary Syndrome in 7% and Renal Failure in 7% (Table 14).

This shows that awareness on these non communicable diseases is very low. This calls for community education on the consequences of these two highly epidemic non communicable diseases and the necessity for early detection and treatment before target organ damage, by community wide screening of all elderly individuals. Due to the inherently greater pretreatment risk status of elderly people, the value of antihypertensive and antidiabetic therapy in degree of protection against major cardiovascular events is greater in elderly patients than in younger patients. Hence the necessity for early detection and treatment must be realized both by the physician and the patient.

Other risk factors

Smoking

In our study 75.6% of males and 3.3% of females were smokers. And 48.9% of males were alcoholics (table 15). Smoking not only has added the risk for cardiovascular events but also has contributed for a significant number of chronic obstructive airway disease (12%) in them.

Dyslipidemia

In our study 34.7% of patients had hypercholesterolemia, 30.7% had cholesterol within normal range and 21.3% had below normal value (table 19). We were not able to do a complete lipid profile for these patients.

BMI and central obesity

In our study 6.7%, 21.3%, 42.7% and 29.3% of the patients were obese, overweight, normal and underweight respectively. More females(43.3%) compared to males were above the range of overweight(Table 16). When defined by waist hip ratio alone 64.4% of males and 86.7% of females are found to be centrally obese. When defined by waist circumference alone only 26.7% of males and 63.3% of females are found to be centrally obese. When central obesity is defined by both waist hip ratio and waist circumference only 24.4% of males and 56.6% of females are falling within the range (Table 17). 76.1% of the patients with BMI above overweight were centrally obese by waist hip ratio.81.3% of the patients with normal BMI were centrally obese by definition of waist hip ratio (Table 18)

This observation can be attributed to the so called ‘Asian Indian phenotype’ characterized by less of generalized obesity as measured by body mass index (BMI) but greater central body obesity as shown by greater waist circumference (WC) and waist-to-hip ratios (WHR). This leads to unique biochemical and hormonal changes including higher plasma insulin levels, greater insulin resistance, lower HDL cholesterol, higher triglyceride levels, increased small dense LDL cholesterol as well as small dense HDL cholesterol and C-reactive protein and leptin levels but decreased adiponectin levels. Thus many Asian Indians fit into the category of metabolically obese, normal weight individuals.

Both waist circumference (WC), waist-to-hip ratio (WHR) are used to define obesity; the debate as to which is the best to assess CVD risk continues. While direct assessment of fat mass may be a better index of obesity-related to health risk, it is difficult to measure this accurately in large epidemiological studies particularly in the field setting. Thus, anthropometry still remains the most widely used method for clinical and epidemiological purposes. Each obesity index has its own implications in relation to health risk in general and CVD risk in particular.BMI, WC and WHR are all shown to be important for estimating CVD risk due to their positive association with various CVD risk factors. Survey of the literature also shows that no single obesity index can be recommended for this purpose from a global standpoint. The recent Interheart study showed that waist-to hip ratio was a much better predictor of CVD events than BMI. Indeed, Interheart also showed for the first time that not only is waist a ‘risk’ factor, but that hip is an independent

'protective'factor. Hence the WHR becomes an even stronger marker because the numerator (waist) is a 'risk' factor while the denominator (hip) is a 'protective' factor and therefore the ratio is, at least theoretically, a stronger predictor than either alone[61].

COMPLICATION PROFILE

Complication profile of our elderly diabetics and hypertensives showed that 48(64%) had cardiac complications in the form of coronary artery disease or congestive heart failure, 23(30.6%) had cerebrovascular complications, 6(8%) had peripheral vascular disease,15(20%) had peripheral neuropathy and 67(89.3%) had chronic kidney disease(Table 23)

Cardiac complications

Cardiac complication is the major macrovascular complication noted. In our study, 48(64%) out of 75 have had cardiac events in the form of either coronary artery disease or congestive heart failure. 28%,4% and 41.3% of the 75 patients had features suggestive of stable angina, unstable angina and myocardial infarction respectively. Of the 31 patients with myocardial infarction only 16(51.7%)had clinically recognized myocardial infarction.Almost half (15 patients(48.3%) had clinically unrecognized myocardial infarction (silent MI) diagnosed by routine electrocardiogram and echocardiographic screening showing regional wall motion abnormality. In a prospective study that investigated the prevalence of presenting clinical manifestations of acute myocardial infarction in 110 older nursing home

residents, clinically unrecognized Q wave myocardial infarction was diagnosed by a routine electrocardiogram in 21% of persons[62]. The Honolulu Hawaii Heart Program showed that after adjustment for age at the time of myocardial infarction,patients with clinically unrecognized myocardial infarction had a 60% to 70% higher risk for death, either from all causes or from coronary vascular disease[63]. Hence this implies that, at least an electrocardiogram screening and if possible an echocardiography is must in all elderly patients in whom the inherent risk for silent MI is high. Early recognition of silent MI by screening and institution of treatment will bring down the mortality.

Of the total (41) cardiac failure patients 29(70.7%) had Left Ventricular (LV) dysfunction and 12(29.3%) had cardiac failure with preserved LV function. Of the LV dysfunction patients 20.7%, 58.6% and 20.7% had mild, moderate and severe LV dysfunction(Table 25). Heart failure is predominantly a disorder of the elderly with prevalence rates increasing exponentially from<1% in population younger than age 50 years to about 10% in individuals older than age 80 years [64]. An important feature that distinguishes heart failure in the elderly from heart failure in the middle age is a striking increase in the proportion of cases that occurs in the setting of normal left ventricular systolic function. Diastolic heart failure accounts for <10% of heart failure cases in persons who are younger than age 60, but >50% of cases after 75 years of age[65]. Hence the physician must measure left ventricular ejection fraction in all people who have congestive heart failure and preferably by echocardiography to determine the appropriate therapy for congestive heart failure.

Degenerative valvular heart disease is less(5.3%) in our study population in comparison to coronary artery disease.

Cerebrovascular complication

30.6% of the patients had cerebrovascular accident, out of which 78.3% were ischemic strokes and 21.7% were hemorrhagic strokes. All the haemorrhagic stroke patients were hypertensive and 3 (13%) of the ischaemic stroke patients were not hypertensive.

Stroke is predominantly a disease of later life;70% of strokes occur in people aged over 65.Early risk factor assessment and prompt treatment is necessary in primary prevention of stroke, as stroke is not only the leading cause of death but is also a major cause of disability leading to impaired quality of life particularly for elderly people. Raised blood pressure is the most important causal and treatable risk factor for stroke. The other risk factors are smoking, alcohol, pre-existing vascular disease(previous stroke or transient ischaemic attack, coronary artery disease, peripheral vascular disease), diabetes and atrial fibrillation.

Peripheral vascular disease:

6 (8%) patients had either symptoms or signs suggestive of peripheral vascular disease in our study. The prevalence of lower-extremity PVD based on ankle brachial blood pressure ratios is approximately 10 to 20 percent of community-dwelling individuals aged 65 and older and 18 percent to 29 percent of patients aged 50 and older in general medical practices.[34-36] And presence of

peripheral vascular disease suggests a greater risk for developing other cardiovascular complications.

Peripheral neuropathy

In our study, 15 (20%) patients had either symptoms or signs suggestive of peripheral neuropathy. Approximately one in five adults over age 60 is affected by peripheral nerve dysfunction.[41]Our study is consistent with this observation. Recent studies comparing elderly patients diagnosed with lower extremity peripheral neuropathy with a control group of non-neuropathic elders over a 1 year period found that the patients with peripheral neuropathy had a fourfold higher incidence of falls.[42-43]Hence early assessment for the presence of peripheral neuropathy with the simple clinical assessment tools such as , assessment of gait and posture, muscle tone and strength, foot deformities, position sensation, unipedal stance, vibratory sensation and ankle jerk is essential in preventing the falls in elderly and its consequences.

Renal disease

In our study, 67(89.3%) of the patients were found to have chronic kidney disease (GFR <90). 29.3%, 45.3%, 12% and 2.6% of the patients were in stage 2, 3, 4 and 5 chronic kidney disease respectively(Table 27). 89.3% of the patients were found to have chronic kidney disease (GFR <90).If serum creatinine of >1.5 mg/dl is taken as cut off for screening, only 14.6% were found to have renal failure. Serum creatinine of >1.5 mg/dl has a sensitivity of 16.4% and specificity of 100%

to diagnose renal failure(GFR <90ml/min). To diagnose severe renal failure (GFR <30ml/min), it has a sensitivity of 90.1% and specificity of 98.4% (Table 28).

Similar results are also obtained in the Ottawa study[66]. They screened 1510 patients and renal failure (GFR ≤ 50 mL/min) was present in 28.9% of the patients, and severe renal failure (GFR ≤ 30 mL/min) was present in 6.4%. A serum creatinine level of greater than 1.7 mg/dL had a sensitivity of 12.6% and a specificity of 99.9% for the detection of renal failure. For the detection of severe renal failure, the sensitivity was 45.5%, with 99.1% specificity.

As people age, a progressive loss of functioning nephrons occurs and only half of the nephrons present at birth typically remain at age 70. The incidence of CRF rises 10 fold with age, from 60 per million per year for those in their third decade to over 600 per million per year for those over 80 years of age. Early referral of such patients to a nephrologist, or to a multidisciplinary team specializing in ESRD care, has been associated with a reduction in health care costs, morbidity, and mortality in patients starting renal replacement therapy. [47-51] For such early referral, serum creatinine is a poor screening test for renal failure in elderly patients, as it leads to marked underinvestigation and underrecognition of renal failure in this population.

Correlation of duration of hypertension and diabetes with cardiovascular complication

Majority (84%) of the patient had hypertension and diabetes for the duration of 1-10 years. The number of patients with hypertension and diabetes for <1 yr and

>10 yrs is very less. Totally 67 major cardiovascular event have occurred in the known hypertensives; out of which 91%(61) of cardiovascular events have occurred in the group of hypertensive patients with1-10 years, whereas only 9%(6) of events have occurred in the other group of patients(Table 29). Since the number of patients is not equally distributed, they are not comparable. A significant result noted is that the rate of occurrence of cardiovascular events is 1 per person in Newly Detected (ND) hypertensive group and the rate is 1.6 per person in known hypertensive of 1-10 year duration. Duration of hypertension appear to play a small role in the rate of occurrence of cardiovascular events.

Totally 66 major cardiovascular event have occurred in the known diabetics; out of which 71.2% (47) of cardiovascular events have occurred in the group of diabetic patients with 1-10 years duration, whereas only 28.8% (19) of events have occurred in the other group of patients(Table 30). Since the number of patients is not equally distributed, they are not comparable. A significant result noted is that the rate of occurrence of cardiovascular events is 1.8 per person in Newly Detected (ND) diabetes group and the rate is 1.9 per person in known diabetics of 1-10 year duration. Duration of diabetes does not appear to increase the rate of event occurrence. However these observations need to be further proved by future large population based studies.

Correlation of risk factors and complications

There is no steady increase in the occurrence of cardiovascular events when the contribution of other risk factors such as smoking, alcoholism, central obesity

(with waist circumference criteria by IDF) and serum cholesterol levels are added up, probably because the number of persons distributed in each cell is very less for comparison (tables 30, 31,32).

Hospital admission details

A total of 167 hospital admissions were reported in these patients. On an average, the hospital admission rate is 0.5 per year in the study population. Major causes for hospital admissions are heart failure (33.5%), acute coronary syndrome (19.2%), stroke and its sequelae (19.2%), COPD (4.2%) and renal failure (3.5%) (Table 34).

A Mangalore study on profile of geriatric inpatient admissions, noted that maximum (20.4%) admissions are for heart disease[67]. Heart failure is a common factor that contributes to institutionalization in a chronic care facility and it is a major source of chronic disability and impaired quality of life in the elderly[68]. Coronary artery disease and cerebrovascular disease ranks next major cause for admissions. Though 89.3% of the study population had chronic kidney disease with GFR<90ml/min, only 3.5% of the admissions are due to renal failure, proving the fact that CKD makes these patients to be at higher risk for cardiovascular events and as such CKD is not the major reason for admission. The other common medical illness that contributed to 4.2% of the medical admissions in our study population is chronic obstructive airway disease. 9(12%) of the male smokers and 3(4%) of the female non smokers were found to be COPD patients in our study. And, 2(3%) of the females were asthmatics.

A Minneapolis study noted that old age, male sex, poor self rated general health, availability of an informal caregiver, having ever had coronary artery disease, having had hospital admission during the previous year and diabetes, all are the major risk factors for repeated admission[69]. Our patients had 92 readmissions in an average duration of 2.4 years. And they had most of these risk factors in them.

Socioeconomic details

Our patients are from poor socioeconomic status, with the average monthly income of their family being Rs.2200. 93.3% of the patients are manual laborers by occupation. 27 (36%) patients are widows or widowers. 76% of the patients need to be supported by their children (Table 21). Their monthly income of around Rs.2200 has to support two generations.13.3% of the patients are supported by their spouse and 10.7% had no one to support them. Only 20% received either widow pension or elderly pension from the Government. Government plans have not reached fully to this needy population. Many of the people didn't even know the presence of beneficial governmental policies for them, owing to their illiteracy. More social workers need to be recruited to educate these people for the betterment of their life.

SUMMARY

1. 75 elderly inpatients with hypertension or diabetes or both were analysed. (Males- 45, Females-30 and mean age was 68 years)
2. Out of the 75 patients, 41.3% had hypertension alone, 16% had diabetes alone and 42.6% had both.
3. Only 4.8% of the hypertensive patients had Isolated Systolic Hypertension (ISH)
4. 11.3% of the diabetics were obese (BMI >30) and 77.2% of the diabetics were centrally obese (defined by WHR).
5. There is no statistically significant association between BMI and diabetes or central obesity and diabetes.
6. 20.5% of the known hypertensives and 34.3% of the known diabetics were not on therapy currently. Rest of the patients who were on drugs too had poor drug compliance and poor hypertension and diabetes control.
7. 54% and 35% of the patients were found to have hypertension and diabetes only after target organ damage.
8. 28% of the patients were with the BMI above the range of overweight. More females (43.3%) compared to males (17.7%) were overweight and obese.

9. 64.4% of males and 86.7% of females were centrally obese (defined by WHR). 26.7% of males and 63.3% of females were centrally obese when defined by waist circumference (IDF criteria for South-East Asians). BMI and central obesity have statistically significant association.
10. 64% had cardiac complications, 30.6% had cerebrovascular complications, 8% had peripheral vascular disease, 20% had peripheral neuropathy and 89.3% had chronic kidney disease.
11. Of the 31 patients with MI, almost half of the patients (15) had clinically unrecognized MI (silent MI) diagnosed by routine electrocardiogram and echocardiographic screening showing regional wall motion abnormality.
12. Of the 41 cardiac failure patients, 70.7% had left ventricular dysfunction and 29.3% had normal LV function.
13. Only 5.3% of the patients had degenerative valvular heart disease.
14. Of the 18 cerebrovascular events, 78.3% were ischemic strokes and 21.7% were hemorrhagic strokes.
15. 89.3% of the patients were found to have chronic kidney disease (GFR<90ml/min). 29.3%, 45.3%, 12% and 2.6% of the patients were in stage 2, 3,4 and 5 chronic kidney disease.
16. Serum creatinine of >1.5 mg/dl has a sensitivity of 16.4% and specificity of 100% to diagnose renal failure (GFR< 90ml/min). To diagnose severe renal failure (GFR< 30ml/min), it has a sensitivity of 90.1% and specificity of 98.4%.

17. On an average the hospital admission rate is 0.5 per year in the study population. Major causes of hospital admissions are heart failure (33.5), acute coronary syndrome (19.2%), stroke and its sequelae (19.2%), COPD (4.2%) and renal failure (3.5%).
18. 76% of the patients had to be supported by their children with their average monthly income of Rs.2200.
19. Only 20% received either widow pension or elderly pension from government.
20. 93.3% of the patients are manual laborers by occupation.

CONCLUSION

1. This study shows that isolated systolic hypertension is less prevalent in Indians.
2. There is no significant association between BMI and diabetes or central obesity and diabetes in elderly Indians.
3. Awareness among the elderly Indians on the need for early detection and regular treatment for hypertension and diabetes is poor. This calls for community wide education on these non-communicable diseases.
4. These elderly Indians are centrally obese but normal weight individuals.
5. Cardiac complication is the most common macrovascular complication noted and renal disease is the most common microvascular complication. But cardiac complications are the major cause for morbidity and hospital admissions.
6. Search for and recognition of silent MI and heart failure with preserved ejection fraction is important in these group of patients.
7. Serum creatinine is not a good screening test for identifying renal disease in these patients. Calculation of GFR with the simple Cockcroft-Gault formula is advisable.
8. Heart failure is the most important cause for morbidity and hospitalization in these patients.

9. These observations need to be confirmed by further larger epidemiological studies for our own data in elderly population.

10. It is important to realize the impact of a rapidly ageing population on our health care system. And we need to gear up for the future challenges posed by this ailing demographics. The various governmental and non-governmental agencies must act in stride and take the required measures for the betterment of senior citizens.

BIBLIOGRAPHY

1. World health organization. Ageing and Health in the WHO South East Asian Region. World Health report 1999; 3-4.
2. Help age India. Aging Scenario, http ://www.helpageindia.com/
3. Sunderlal, et al. A study on senior citizens in rural areas. Health for the millions 1999; 25: 18-20.
4. Vasan RS, Beiser A, Seshadri S et al. Residual life time risk for developing hypertension in middle-aged women and men: The Framingham heart study. JAMA 2002; 287: 1003-1010.
5. Kaplan NM. Hypertension in the population at large. In: Kaplan's clinical hypertension, 8th edition. Kaplan NM, Lieberman E, Neal W. Philadelphia : Lippincott Williams & Wilkins ; 2002
6. Franklin SS, Larson MG, Khan s et al. Does the relation of blood pressure to coronary heart diseases risk change with aging? The Framingham heart study. Circulation 2001; 103: 1245-1249.
7. Norman M Kaplan; Systolic blood pressure: A determinant of comorbidity, 2003 ; 1-7.
8. C. Rajkumar and C.J. Bulpitt: Hypertension; Oxford textbook of Geriatric Medicine, 2nd edition.
9. King H, Aubert RE, Herman WH Global burden of diabetes 1995-2025; prevalence, numerical estimates and projection Diab care 1998; 21: 1414 – 1431.

10. Ramachandran A, Snehalatha C, Kapul A et al. High prevalence of diabetes and impaired glucose tolerance in India: National urban diabetes survey. Diabetologia 2001; 44: 1094-1101.

11. Ramachandran A, Snehalatha C, Baskar ADS et al. Temporal changes in prevalence of diabetes & IGT associated with life style transition occurring in rural population in India. Diabetologia 2004; 47: 860-865.

12. Sinclair AJ, Robert IM, Croxson SCM. Mortality in older people with Diabetes mellitus. Diabet Mud 1996: 14: 639-47.

13. Manejewski ML, Maynard C. Diabetes related utilization and costs for in patient and outpatient services in the veterans administration Diabetes care 2004; 27: 699-703.

14. Meneilly GS, Tessier D. Diabetes in elderly adults. JG Crontol 2001; 564: M5-13.

15. Meneilly GS, Cheung E, Twokkoh. Counter regulatory hormone response to hypoglycemia in the elderly patients with Diabetes. Diabetes 1994; 43:403-10.

16. Thomson FJ, Masson EA, Leeming JT, et al. Lack of knowledge of symptoms of hypoglycemia by elderly diabetic patients. Age aging 1991; 20: 40-6.

17. Benfante, R and Rud D. (1990) Is elevated serum cholesterol level a risk factor for coronary heart disease in the elderly? Journal of the American Medical association, 263, 393

18. Jajeh, C.L., Ostfeld, A.M., and freeman, D.H. Smoking and Coronary heart disease mortality in the elderly. Journal of the Americal medical association, 252, 2831-4.

19. Hermanson B., Omenn, G.S., Kronmal, R.A., et al. Beneficial 6 years outcome of smoking cessation in older men and women with coronary artery disease results from the CASS registry NEJM, 319, 1365-9.

20. Marmot, M and Brunner E. Alcohol and cardiovascular disease; the status of the U shaped curve. British Medical Journal, 296, 887-9.

21. Somes GW Kritchersky SB, Shorr RI et al. Body mass index, weight change, and death in older adults. The systolic hypertension in the elderly program. AM J Epidemiol 2002; 156(2): 132-8.

22. Heiat A. Vaccarino V, Krumhoiz HM. An evidence based assessment of federal guidelines for overweight and obesity as they apply to elderly persons. Arch Intern Med. 2001; 161(9): 1194-203.

23. Omran ML, Morley JE. Assessment of protein energy malnutrition in older persons. Part II: Laboratory evaluation. Nutrition 2001; 16(2): 131-40.

24. Potter JF, Schafer DF, Bohi RL. In hospital mortality as a junction of body mass index: an age dependant variable. J. Gerontol 1988; 43(3): M59-63.

25. Villereal DT, Apohian CM, Kushner RF et al. Obesity in older adults: Technical review and position statement of the American Society for nutrition and NASSO, The obesity society. AM J clin Nutr 2004 82 (5): 923-34.

26. Beaufrere B, Morio B. fat and protein redistribution with aging: Metabolic considerations. Eur J clin Nutr 2000; 54 (Suppl 3): S48-53.

27. Aronow WS, Ahn C, Gutstein H. Prevalance and incidence of cardiovascular disease in 1160 oldermen and 2464 older women in a long term health care facility. J Gerontol A boil rei med sci 2002 ; 514: M45-6

28. Vokonas PS. Kannel WB. Epidemiology of coronary heart disease in the elderly. In: Aronow WS, Fleg JL, editors. Cardiovascular disease in the elderly. 3rd ed. New York: Maral Dekker : 2004 p. 189-214.

29. Kannel WB, Belanger AJ. Epidemiology of Heart failure Am Heart J 1991 ; 121 : 951 -7.

30. Kannel WB, Abbott RD, savage DD, et al. Epidemiologic feature of chronic atrial fibrillation. The Framingham study. N Engl J Med 1982 ; 306 : 1018-22.

31. Brown R.D. Whinsnant , J.P., sicks, J.D., O'fallon, W.M., and Wibers, D.O. (1996) stroke incidence prevalence and survival secular trends in Rochester, Minnesota. Stroke, 27, 373-80.

32. Meijer WT, Grobee DE, Hunink MGM, Hofman A, Hoes AW. Determinants of peripheral arterial disease in the elderly: the Rotterdam Study. Arch Int Med 2000;160(19):2934-8.

33. American Heart Association. PAD Quick Facts. Diseases and Conditions. Available at: http://www.americanheart.org/

34. Fowkes FG. Edinburgh Artery Study: prevalence of asymptomatic and symptomatic peripheral arterial disease in the general population. International Journal of Epidemiology 1991;20:384-92.

35. Schroll M, Munck O. Estimation of peripheral arteriosclerotic disease by ankle blood pressure measurements in a population study of 60 year-old men and women. J Chronic Dis 1981;34:261-9.

36. Meijer WT, Hoes AW, Rutgers D, Bots ML, Hofman A, Grobbee DE. Peripheral arterial disease in the elderly: the Rotterdam Study. Arterioscler Thromb Vasc Biol 1998;18(2):185-92.

37. McDermott MM. Peripheral arterial disease: epidemiology and drug therapy. Am J Geriatr Cardiol 2002;11(4):258-66.

38. Weitz JI, Byrne J, Clagett GP, et al. Diagnosis and treatment of chronic arterial insufficiency of the lower extremities: a critical review. Circulation 1996;94(11):3026-49.

39. Criqui MH, Langer RD, Fronek A, et al. Mortality over a period of 10 years in patients with peripheral arterial disease. N Engl J Med 1992;326(6):381-6. 15. Mayfield JA, Reiber GE, Sanders LJ, Janisse D, Pogach LM. Preventive foot care in diabetes. Diabetes Care 2004;27 Suppl 1:S63-S64.

40. American Academy of Family Physicians. Recommendations for periodic health examinations. Clinical Care and Research. http://www.aafp.org/x24973.xml.

41. Richardson JK, Ashton-Miller JA: Peripheral neuropathy: An often over-looked cause of falls in the elderly. Postgrad Med 1996;99(6): 161-72.

42. Richardson JK, Ching C, Hurvitz EA: The relationship between electromyographically documented peripheral neuropathy and falls. J Am Geriatrics Society 1992;40:1013-17.

43. Richardson JK, Hurvitz EA: Peripheral neuropathy: A true risk factor for falls. J Gerontol 1995; SOA(4):M211-M215.

44. James W. Mold, Sara K. Vesely, Barbara A. Keyl, Joan B. Schenk et al, The Prevalence, Predictors, and Consequences of Peripheral Sensory Neuropathy in Older Patients. The Journal of the American Board of Family Practice 17:309-318 (2004).

45. Giuseppe P, Mario S, Barbara PG, et al. Elderly patients on dialysis: epidemiology of an epidemic. *Nephrol Dial Transplant.* 1996;11 (suppl 9):26-30.

46. Jungers P, Chauveau P, Deschamps-Latscha B, et al. Age and gender-related incidence of chronic renal failure in a French urban area: a prospective epidemiologic study. *Nephrol Dial Transplant.* 1996;11:1542-1546.

46. Ifudu O, Dawood M, Homel P, Friedman EA. Excess morbidity in patients starting uremia care without prior care by a nephrologist. *Am J Kidney Dis.* 1996;28: 841-845.

47. Jungers P, Zingraff J, Albouze G, et al. Late referral to maintenance dialysis: detrimental consequences. *Nephrol Dial Transplant.* 1993;8:1089-1093.

48. Innes A, Rowe PA, Burden RP, Morgan AG. Early deaths on renal replacement therapy: the need for early nephrological referral. *Nephrol Dial Transplant.* 1992;7:467-471.

49. Sesso R, Belasco AG. Late diagnosis of chronic renal failure and mortality on maintenance dialysis. *Nephrol Dial Transplant.* 1996;11:2417-2420.

50. Stehman-Breen CO, Sherrard DJ, Gillen D, Caps M. Determinants of type and timing of initial permanent hemodialysis vascular access. *Kidney Int.* 2000; 57: 639-645.

51. Schmidt RJ, Domico JR, Sorkin MI, Hobbs G. Early referral and its impact on emergent first dialyses, health care costs, and outcome. *Am J Kidney Dis.* 1998; 32:278-283.

52. Perrone RD, Madias NE, Levey AS. Serum creatinine as an index of renal function: new insights into old concepts. *Clin Chem.* 1992;38:1933-1953.

53. Dwivedi S,Singh G, Agarwal MP et al.Profile of hypertension in elderly subjects. JAPI 2000;48:1047-1049.

54. Jones JK, Gorkin L,Lian JF et al.Discontinuation of and changes in treatment after start of new courses of antihypertensive drugs:a study of a united kingdom population.Br Med J 1995; 311:293-295.

55. Singh NP, Pugazhendhi V, Das AK, Prakash A, Agarwal SK et al. Clinical and laboratory profile of diabetes in elderly.J Indian Med Assoc. 1999 Apr ; 97 (4):124-8.

56. Jung ED, Lee J, Shon HS. The correlation between central obesity and glucose, lipid metabolism and Macrovascular complication in elderly Type 2 diabetes: J Korean Diabetes Assoc. 2007 Jul ; 31(4): 343-350.Korean.

57. Joshi R. Metabolic syndrome – Emerging clusters of the Indian Phenotype. J Assoc Physicians India 2003; 51: 445-6.

58. Deepa R, Sandeep S, Mohan V. Abdominal obesity, visceral fat and type 2 diabetes 'Asian Indian phenotype'. In: Mohan V, Gundu Rao, eds. Type 2 diabetes in South Asians: Epidemiology, risk factors and prevention. Jaypee Brothers Medical publishers, 2006; 138-52.

59. Mohan V, Sharp PS, Cloke HR, Burrin JM, Schemer B, Kohner EM. Serum immunoreactive insulin responses to a glucose load in Asian Indian and European Type 2 (non insulin dependent) diabetic patients and control subjects. Diabetologia 1986;29:235-37.

60. Chandalia M, Abate N, Garg A, Stray-Gundersen J, Grundy SM. Relationship between generalized and upper body obesity to insulin resistance in Asian Indian men. J Clin Endocrinol Metab 1999;84:2329-35.

61. Yusuf S, Hawken S, Ounpuu S, Bautista L, Franzosi MG, Commerford P, et al. Obesity and the risk of myocardial infarction in 27000 participants from 52 countries: a case-control study. The Lancet 2005; 366: 1640-9.

62. Aronow WS, Starling L, Etienne F, et al. Unrecognised Q - wave myocardial infarction in patients older than 64 years in a long term health care facility. Am J Cardiol 1985; 56: 483.

63. Yano K, MacLean CJ. The incidence and prognosis of unrecognized myocardial infarction in the Honlulu, Hawaii Heart program. Arch Intern Med 1995; 22: 96-102.

64. Kannel WB, Belanger AJ. Epidemiology of heart failure. Am Heart J 1991; 121: 951-7. 65. Vasan RS, Larson MG, Benjamin EJ, et al. Congestive heart failure in subjects with normal versus reduced Left ventricular ejection fraction: Prevalence and mortality in a population based cohort .J Am coll Cardiol 1999; 33: 1948-55.

66. Peter J Swedko ; Heather D. Clark ; Koushi Paramsothy; Ayub Akbari, et al. Serum Creatinine Is an Inadequate Screening Test for Renal Failure in Elderly Patients. Arch Intern Med 2003;163 :356-360.

67. Vijaya K, Ravikiran E et al. Profile of Geriatric in-patient admissions.Indmedica – Journal of the academy of Hospital administration.

68. Hobbs FDR, Kenkre JE, Roalfe AK, et al. Impact of Heart failure and left ventricular systolic dysfunction on quality of life.A cross-sectional study comparing common chronic and medical disorders and a representative adult population. Eur Heart J 2002 ; 23 : 1867-76.

69. Boult C, Dowd B, McCaffey D et al. Screening elders for risk of hospital readmissions. J Am Geriatr soc. 1993 Aug ; 41(8) : 811-7.

PROFORMA

1. Name : 2. Age/Sex : 3. Inpatient no :

4. Details of Hypertension and Diabetes Mellitus

a. Duration

b. Reason for diagnosis – Target organ damage / screening

c. Treatment taken

d. Drug compliance – regular / irregular

e. Diabetes and Hypertension control – fair / poor

5. Other Cardiovascular Risk Factors

a. Smoking – Y/N

b. Alcohol – Y/N

c. Type of occupation (Registrar Generals Occupational Classification in England and Wales)

I	–	Professional
II	–	Intermediate occupation
III N	–	Non manual skilled
III M	–	Manual skilled
IV	–	Partly skilled
V	–	Unskilled

d. Obesity (BMI, Waist-Hip ratio, waist circumference)

e. Dyslipidemia (serum cholesterol)

6. Complication Profile

a. Cardiac status

- Assessment for symptoms and signs of coronary artery disease (stable angina, unstable angina, MI)
- Assessment for symptoms and signs of cardiac failure, reason for cardiac failure and Staging of cardiac failure.
- Lab investigations – ECG, Echo

b. Cerebrovascular Status

- Assessment for symptoms and signs of TIA and CVA.
- Lab investigations – CT Brain (infarct/ heamorrhage)

c. Peripheral vascular disease

- Assessment for symptoms and signs of claudication pain,absent pulses, arterial ulcer, gangrene and history of amputation.

d. Peripheral Neuropathy

- Assessment for symptoms and signs of peripheral neuropathy (paresthesia, impaired sensation, motor weakness, deep tendon reflexes, trophic changes, callus formation, ulcer, amputation)

e. Renal status

- Assessment for symptoms and signs of renal failure (facial puffiness, pedal edema, decreased urine output)
- Lab investigations – urea, creatinine, spot urine albumin, Spot urine protein creatinine ratio, estimated GFR using Cock Craft gualt calculation.

7. Socio Economic Details

a. Marital status – widow/widower
b. Taken care by Spouse/ Children/ Self
c. Monthly income
d. Pension details

8. Other Co morbid Illness

9. Details of Current and Previous Medical Admissions

a. Current admission reason
b. Past medical admissions
    - Frequency of admissions
    - Reason for admissions

CODING

Sex : Male - 1 Female - 2

Dur : Duration in years

ND/JNC JNC stage 1 – 2

JNC stage 2 – 3

JNC Pre HT – 1

RFI / C / D

Acute Coronary syndrome (USA/MI/SMI) – 1

Heart Failure – 2

Valvular Heart Disease – 3

Cerebrovascular Accident – 4

Diabetic foot – 5

Renal Failure – 7

Diabetic acidosis – 8

Hyperglycemic Hyperosmolar Syndrome – 9

Hypoglycemia – 11

Injection – 12

Others – 13

COPD – 14

Scar seizure – 15

R_x in HT

ACE inhibitors – 1

B blockers – 2

Calcium channel blockers – 3

Diurectics – 4

No drugs – 0

DM – Type

Type 1 DM – 1 Type 2 DM – 2

R_x in DM

Glibenclamide – 1 Glipizide – 2 Metformin – 4

Insulin – 5 No drugs – 0

Work

Professional – 1 Intermediate – 2 Non manual skilled – 3

Manual skilled – 4 Partly skilled – 5 Unskilled – 6

Chol – Sr.Cholesterol in mg/dl

HF

3 – Heart failure controlled with medications

4 – Resistant heart failure

ECG

Normal – 0 Ischemia – 1 Injury – 2 Infarct – 3 Bundle Branch blocks – 4

LVH – 5 Arrhythmia – 6 Corpulmonale – 7

PHT

Mild – 1 Moderate – 2 Severe – 3

R/G

Regional wall motion abnormality – 1

Global hypokinesia – 2

CT in CVD

Ischemic stroke – 1 Hemorrhagic stroke – 2

CMD

Present – 0 Lost – 1

Care taker

Spouse – 1 Children – 2 Self – 3

MI

Monthly income in rupees rounded to thousands

Rest of the columns

Yes – 1 No – 0